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A STUDY OF COMMON MOTOR ACHIEVEMENTS AT THE PRESCHOOL AGES

CARRA LOU McCASKILL AND BETH L. WELLMAN[1]

INTRODUCTION

The object of this experiment was to study some common motor achievements of children at the preschool ages in an effort to discover (1) the stages of development in selected motor achievements, (2) the sequence of development of these stages, (3) the interrelationships of these motor achievements, and (4) their relationship to sex and to ascendance scores.

The tests devised were given to ninety-eight children in the preschool laboratories of the University of Iowa. These tests were designed to provide means of discovering the motor development of children from two to six years of age by utilization of normal activities. The selected activities were: ascending and descending ladders, ascending and descending steps, hopping, skipping, jumping, balancing on path and circle, ball throwing, ball catching, and ball bouncing.

Preliminary observation and testing were carried through in order to determine what the stages of performance were. The objective was to record the stages which clearly differed one from the other. How they line up in regard to age progress is the ultimate end of the study.

Bayley (1) made a seriatim study of sixty-one children, testing these children from infancy up to three years of age. She says, "There remains the possibility that the motor functions measured during the first three years are actually less discreet and independent than are the motor skills measured at later ages. If this is true, we may find that a gradual increase in the functional independence of motor skills will continue for some time after the age of three years." (1, p. 18) One purpose of the present study is to discover the increase of motor skills into the four-, five-, and six-year levels.

METHOD OF PROCEDURE

It was the idea from the beginning to keep each activity in the test situation as simple as possible so that it could be reproduced easily. For the ball throwing and ball bouncing a "location field" was devised for determining the distance and direction of the child's throw or bounce. This field was made of heavy brown paper 8 feet wide and 17 feet long, with a 4 inch strip of wall board at each end to anchor it. The width was marked off into zones. Zone 1 was 2 feet in width and extended down the center of the field, with zones 2, 3, and 4, each 1 foot wide, to the right and left of zone 1. The length was marked off into distances; distance 1 was 3 feet in length and distances 2, 3, 4, 5, 6, 7, and 8 each 2 feet in length. For the throw or bounce the child stood at the edge of and on the center line of the field and threw or bounced the ball to the experimenter at the opposite end of the field. The results were recorded according to zone and distance and the child's use of one or both hands.

In the catching series the ball was thrown to the child at a level with his chest each time, as nearly as was possible. The method used in the attempt to catch the ball, the successes, and whether or not the child used defense movements when the ball was tossed to him were all recorded. Two balls were used throughout, one 16-1/4 inches in circumference, the other

[1]From the Iowa Child Welfare Research Station, University of Iowa. The writers wish to thank Miss Dorothy E. Bradbury for help in condensing the material for this article.

9-1/2 inches. Three trials were given for each performance with each ball.

To determine the child's ability to maintain equilibrium and balance, a walking path and a circle were used. A demonstration was given in each case. If the child failed to respond, he was asked to follow the experimenter as she walked on the path or circle. The path, 10 feet long and 1 inch wide, was drawn on a large piece of brown paper and colored red. The circle was cut from wall board and was 4 feet in diameter. A strip (1 inch wide) was drawn around its outer border and colored red like the path. The number of times the child stepped off the path and circle on each trial was recorded. Three trials were given on each. If the child set one foot off the line for balance but did not take a step, he was not penalized.

Four heights were used for the jumping--boxes 8, 12, 18 and 28 inches in height. The child was given three trials at each height and was checked according to the method he employed in the jump.

The child was asked to hop on one and on both feet and a demonstration of each was given him. He was given three trials at each. The stages were recorded in number of steps. Four items were listed under skipping: walking, shuffle, skipping on one foot, and skipping on alternating feet. The experimenter skipped and asked the child to follow her. The shuffle has a rhythmic quality--the same foot is always forward at each advance. It is definitely in advance of walking and is not the same high step the children employ in galloping.

Both ascending and descending steps were tested on short and long flights. The short flight had 4 steps 7 inches in height with an 11 inch tread. The long flight had 11 steps of the same height and tread. The rail on both flights was 29 inches in height. The steps on which the kindergarten children were tested were slightly different. The short flight had 4 steps 7 inches in height with a tread of 10 inches and the long flight 12 steps 6-1/4 inches in height with a tread of 11-3/4 inches. The hand rail was 34 inches above the steps. The child had three trials on ascending and descending both flights of steps.

For ladder climbing two ladders were used. One had twelve rungs 6 inches apart, the other six rungs 12 inches apart. The ladders were placed at approximately a 45 degree angle each time. This placement was kept constant by placing the same ladder rung against the support each time.

TREATMENT OF DATA

Scoring

Scores were assigned the various stages of each skill according to their difficulty of performance as evidenced by the percentage of children at each age who accomplished them. They are shown in the section on Motor Age Assignments. The term "mark time" in ascending and descending steps and ladders was applied to bringing one foot to the level of the other and stopping instead of moving past as is done in alternating. "With support" meant holding to the rail. In the ball throwing series all trials fell in zones 1 and 2. Since those which fell in zone 2 were often the result of attempting to use a superior method, the final score on throwing was based on distance alone.

Partial Score Groupings

In order to obtain a range of scores sufficiently large to give significant correlations, the various skills were combined into partial score groups. The items which seemed more similar were grouped together. The resulting combinations were: (1) steps and ladders (ascending and descending long and short flight of stairs, large and small ladders); (2) ball activities (throwing, catch-

ing and bouncing large and small balls); (3) jumping (8, 12, 18 and 28 inch jump); (4) hopping, skipping, walking path, and circle (hopping on one foot, hopping on both feet, skipping, walking on path, walking on circle).

These partial scores were then correlated for each sex in order to discover what the quantitative relationship was in each case. The correlations are given in Table 1.

TABLE 1

Measures Correlated	Boys		Girls	
	Number	Correlation	Number	Correlation
Total Group				
Steps and ladders with ball activities	50	.54 ± .10	48	.72 ± .06
Steps and ladders with hopping, skipping, etc.	50	.69 ± .07	48	.79 ± .05
Ball activities with hopping, skipping, etc.	50	.69 ± .07	48	.74 ± .06
Younger Group (26 to 53 Months)				
Steps and ladders with ball activities	16	.40 ± .21	29	.66 ± .10
Steps and ladders with hopping, skipping, etc.	16	.72 ± .12	29	.72 ± .09
Ball activities with hopping, skipping, etc.	16	.69 ± .13	29	.75 ± .08
Jumping Series (Boys, 26 to 53 months; girls, 26 to 48 months)				
Jumping with steps and ladders	16	.72 ± .12	21	.79 ± .08
Jumping with ball activities	16	.81 ± .07	21	.74 ± .11
Jumping with hopping, skipping, etc.	16	.77 ± .08	21	.84 ± .07

The correlations between these various groups of skills are high and have a wide spread, from .40 to .84. This is contrary to the findings reported by previous studies of motor development. In the present study the correlations are affected to some extent by the age range. The total group ranges in age from two to six years.

Because of the fact that after the age of forty-eight months for the girls and fifty-three months for the boys the scores on the jumping series were practically perfect throughout, the correlations were run on this series only up to those ages. The correlations between the jumping series and each of the other groups are high, ranging from .72 to .84.

With two exceptions (the correlations between the jumping series and ball activities, and between steps, etc., and hopping, skipping, etc.) all the correlations for the girls are higher than those for the boys.

Since there was a large scattering of perfect scores in the two upper age groups, correlations were run for both sexes on the three lower age groups separately. The ages in these ranged from twenty-six to fifty-three months. The correlation between steps, etc., and ball activities for the boys is .40, the lowest correlation in any of the groupings. The corresponding correlation for the girls is .66. The other correlations of the series were not much affected by the reduction in age range. This indicates that there is a high correlation between the groups of skills and that the wide age range is not entirely responsible for the high correlations obtained in the total group series.

As a further check on this point, there is need for correlations within still

narrower age ranges. For this reason correlations were run on age group forty-two to fifty-three months for the twenty girls. This was the only age and sex group large enough to give significant results. The correlations for girls are as follows: Steps, etc. with ball activities, .32 ± .17; Steps, etc. with hopping, etc., .32 ± .17; Ball activities with hopping, etc., 28 ± .18.

With this very narrow age range and small number of cases, the correlations are noticeably reduced.

TABLE 2

Months	Number	Mean	Standard Deviation	Standard Error
Steps and Ladders				
30 to 41	13	19.5	5.53	1.53
42 to 53	26	23.6	5.18	1.02
54 to 65	28	28.8	3.37	.64
66 to 74	25	29.7	3.33	.67
Ball Activities				
30 to 41	13	14.2	4.47	1.24
42 to 53	26	23.1	4.89	.96
54 to 65	28	26.5	5.28	.99
66 to 74	25	30.8	5.21	1.04
Jumping				
30 to 41	13	7.2	2.58	.71
42 to 53	26	11.0	1.27	.25
54 to 65	28	11.7	.88	.17
66 to 74	25	12.0	.00	.00
Hopping, Skipping, etc.				
30 to 41	13	5.2	3.25	.90
42 to 53	26	13.2	10.58	2.07
54 to 65	28	14.2	7.34	1.39
66 to 74	25	15.5	18.26	3.65
Totals				
30 to 41	13	46.2	10.63	2.94
42 to 53	26	70.9	10.58	2.08
54 to 65	28	81.4	7.34	1.38
66 to 74	25	84.0	18.26	3.65

Means, Standard Deviations, and Critical Ratios on Partial Scores

The means, standard deviations, and standard errors for each age group, except the two-year-old group, on all partial scores are given in Table 2. The two-year-old group was too small (six children) for figures on it to be statistically significant.

The maximum score for each partial group is as follows: steps and ladders, 32; ball activities, 53; jumping, 12; hopping, skipping, etc., 17.

The highest possible score for any individual then is 114. The highest score by any child in this study, 102, was made by a boy seventy months of age. The lowest score, 14, was made by a girl twenty-six months of age.

Table 3 gives the critical ratios between age groups on each partial score. These ratios show to what degree of certainty the performance of one age group is significantly different from that of another age group on each partial score. A critical ratio of 3 or more indicates practical certainty that one age group's performance is more advanced than that of another age group.

The ratio between the three- and four-year-olds on the partial score for steps and ladder is 2.20 (93 chances in 100 that the true difference is greater than zero). In all other comparisons, the four-year-old group is significantly

TABLE 3

Age Groups, Years	Steps and Ladders	Ball Activities	Jumping	Hopping, Skipping, etc.	Total Scores
3 and 4	2.20	5.66	5.08	7.26	6.86
3 and 5	5.59	7.68	6.11	9.06	10.83
3 and 6	6.07	10.22	6.67	10.72	8.06
4 and 5	4.37	2.42	2.13	1.67	4.23
4 and 6	5.02	5.42	3.71	3.34	3.11
5 and 6	.93	3.00	1.72	1.79	.64

superior to the three-year-old group.

It will be noticed that the critical ratio between the five- and six-year-old groups approaches certainty in only one case. Doubtless this is true because by the age of five and six years the children have reached approximately the maximum of ability in the specific motor activities used in this experiment. This assumption is substantiated by the fact that the one case in which the ratio between these two groups is significant is that of the ball activities. Continued progress in the ability to catch, bounce, and throw balls is possible on past the six-year level, whereas by six years all children are alternating without support when ascending and descending steps and have reached a similar level in the other activities.

The ratio between the four- and five-year-old groups on the partial score for ball activities is 2.42. There are 95 chances in 100 here that there is a difference greater than zero. The ratio between those ages in the partial score for the jumping series is 2.13. There are 92 chances in 100 of a significant difference in that case. These ratios may be affected by the relative percentages of boys and girls. There are twenty girls as opposed to six boys in the four-year-old group and ten girls as opposed to eighteen boys in the five-year-old group.

On the partial score for the skipping and hopping series, the ratio between the four- and five-year-old groups is only 1.67. There are only 87 chances in 100 that there is a significant difference. Here again the relative percentage of boys and girls may be effective.

From the total scores it will be seen that there is a significant difference between each two age groups except the five- and six-year-old groups. The ratio here is only .64. The nature of the tests in this study may explain that. It is probably because the majority of the children at the five- and six-year levels have reached approximately maximum ability in the activities used.

Reliability

A total of forty-six retests was given within a week following the original test in each case. The age range of the retest cases was from twenty-seven to seventy-two months. When the total score of the original test was correlated with the total score of the retest, a correlation coefficient of .98 $\pm$ .004 was obtained. The activities appealed to the children as normal play situations, they enjoyed the "games", and no particular motivation was necessary; so their performance in each test was normal and represented their level of ability at that time. This and the wide age range probably account for the high correlation.

The percentage of children who did not change scores on each achievement was then figured. Table 4 gives a record of these percentages. They are high, denoting little change except for those of the ball activities and walking the circle. For the ball activities the scoring scheme was more minute and de-

tailed than for any of the other activities so that a greater variation was easily possible, with less actual difference in performance.

The distribution of changes on total scores, expressed in percentages for both boys and girls is given in Table 5.

TABLE 4

PER CENT OF CHILDREN WHOSE SCORES REMAINED UNCHANGED ON RETEST
(27 GIRLS, 19 BOYS)

	Steps and Ladders							
	Ascending Long Steps	Descending Long Steps	Ascending Short Steps	Descending Short Steps	Ascending Large Ladder	Descending Large Ladder	Ascending Small Ladder	Descending Small Ladder
Girls	97	87	100	97	97	93	100	93
Boys	100	90	95	90	95	95	100	100
Total	98	87	98	94	96	94	100	96

	Ball Activities					
	Throw Large Ball	Catch Large Ball	Throw Small Ball	Catch Small Ball	Bounce LargeBall	Bounce Small Ball
Girls	49	52	97	78	78	82
Boys	37	48	58	53	74	74
Total	44	50	81	78	77	79

	Jumping			
	8 Inches	12 Inches	18 Inches	28 Inches
Girls	100	97	97	89
Boys	100	95	95	95
Total	100	96	96	92

	Hopping, Skipping, Etc.				
	Hop One Foot	Hop Both Feet	Skip	Walk Path	Walk Circle
Girls	89	89	100	97	75
Boys	85	100	100	95	64
Total	87	94	100	96	70

TABLE 5

Change	Boys (19)	Girls (27)
No change	.21	.26
1 point	.26	.30
2 points	.26	.15
3 points		.03
4 points	.10	.10
5 points		.03
6 points		.07
7 points		
8 points	.10	.03
9 points		
10 points	.05	

It will be seen that this distribution ranges from no change to 10 points change. Three-fourths of the children have no change or only 1 or 2 points change.

Sex Comparisons

Means and Standard Deviations. Table 6 presents the means and standard deviations for boys and for the girls on each partial score for four-, five-, and six-year-old children. There was an insufficient number of cases in the two- and three-year-old groups to justify division by sex.

Because of the small number of cases comparisons on sex differences can be

TABLE 6

MEAN AND STANDARD DEVIATIONS ON EACH PARTIAL SCORE FOR FOUR-, FIVE-, AND SIX-YEAR-OLD BOYS AND GIRLS

Group	42 to 53 Months			54 to 65 Months			66 to 74 Months		
	Cases	Mean	Standard Deviation	Cases	Mean	Standard Deviation	Cases	Mean	Standard Deviation
Steps and Ladders									
Boys	6	27.17	4.18	18	29.61	2.98	16	29.25	3.80
Girls	20	22.50	4.96	10	27.40	3.56	9	30.44	2.06
Ball Activities									
Boys	6	25.83	4.98	18	27.44	4.26	16	30.94	6.27
Girls	20	22.30	4.56	10	24.70	6.37	9	30.56	2.36
Jumping									
Boys	6	11.67	.74	18	11.56	1.07	16	12.00	.00
Girls	20	10.90	1.34	10	12.00	.00	9	12.00	.00
Hopping, Skipping, Etc.									
Boys	6	12.50	3.73	18	13.67	2.60	16	14.94	1.75
Girls	20	13.30	2.97	10	15.80	1.78	9	16.44	.96
Total									
Boys	6	77.17	10.43	18	82.28	6.44	16	87.13	8.60
Girls	20	69.00	9.87	10	79.90	8.50	9	89.44	3.83

considered only as suggestive. However, the results are quite consistent as between age groups. Boys appear to be somewhat superior on steps and ladders and ball activities and girls on hopping and skipping.

Motor and Ascendant Behavior Score Comparisons

Ascendance scores[2] were available for sixteen of the three-year-old and seventeen of the four-year-old children. The correlation between the motor scores and these ascendance scores for the three-year-old group was .006 and for the four-year-old group .27, indicating that there is little or no relationship between these motor achievements and the ascendant behavior of preschool children.

MOTOR AGE ASSIGNMENTS

Age at par, or motor age, was determined for each stage of development of each skill and the performances arranged in a tabulation according to motor age. This tabulation shows the sequence of development from descending the large ladder by marking time cautiously, credited at twenty-four months, to bouncing the large ball with one hand a distance not greater than three feet, credited at seventy-one months.

Motor age assignments were made according to the midpoint, that is, the point of age in months at which 50 per cent of the children made a given score or better than that score, and the other 50 per cent made less than the given score. This method was based on the assumption that there is an even growth per month in a year interval. These age assignments were figured according to the method devised by Thurstone (4). Thurstone's formula is:

$$\text{Age at par} = y + \frac{.50 - P_1}{P_2 - P_1}$$

P_1 = percentage immediately below 50 per cent
P_2 = percentage immediately above 50 per cent
y = age which has the P_1 correct answers

[2]The ascendance scores were taken from a study by Page (3), who used the technique worked worked out by Jack (2).

TABLE 7

Months	Score	Item
71	4	bouncing large ball, one hand, distance 1
68	6	catching large ball, elbows at side of body, success on 2 or 3 trials
65	3	bouncing large ball, both hands, distance 3
65	7	throwing small ball, both hands or one hand, distance 7
63	5	throwing large ball, both hands or one hand, distance 5
62	4	descending large ladder, alternate feet, with facility
60	4	hopping on one foot, 10 or more steps
60	3	skipping, alternate feet
57	6	throwing small ball, both hands or one hand, distance 6
56	3	descending large ladder, alternate feet, with caution
55	5	catching small ball, elbows at side of body, no success or success on one trial
55	4	descending long steps, alternate feet, unsupported
55	3	hopping one foot, 7 to 9 steps
53	4	throwing large ball, both hands or one hand, distance 4
53	4	descending small ladder, alternate feet, with facility
52	5	throwing small ball, both hands or one hand, distance 5
51	3	descending small ladder, alternate feet, with caution
51	5	catching large ball, elbows at side of body, no success or success on one trial
50	4	catching small ball, elbows in front of body, success on 2 or 3 trials
49	4	descending short steps, alternate feet, unsupported
48	3	descending long steps, alternate feet, with support
48	3	descending short steps, alternate feet, with support
47	4	ascending large ladder, alternate feet, with facility
46	2	bouncing large ball, both hands, distance 2
46	3	jumping 28 inches, alone, feet together
46	2	hopping one foot, 4 to 6 steps
45	3	ascending large ladder, alternate feet, with caution
45	3	walking circle, no steps off
44	4	throwing small ball, both hands or one hand, distance 4
44	4	catching large ball, elbows in front of body, success on 2 or 3 trials
43	1	hopping one foot, 1 to 3 steps
43	2	jumping 28 inches, alone, one foot ahead
43	3	throwing large ball, both hands or one hand, distance 3
43	2	skipping on one foot
42	4	hopping both feet, 10 or more steps
41	4	ascending long steps, alternate feet, unsupported
41	3	hopping two feet, 7 to 9 steps
40	2	hopping two feet, 4 to 6 steps
40	5	bouncing small ball, one hand, distance 2
38	2	descending large ladder, mark time, with facility
38	4	ascending small ladder, alternate feet, with facility
38	3	catching small ball, elbows in front of body, no success or success on one trial
38	1	skipping, shuffle
38	1	hopping both feet, 1 to 3 steps
37	2	catching small ball, arms straight, success on 2 or 3 trials
37	3	jumping 18 inches, alone, feet together
37	3	walking path, no steps off
36	1	jumping 28 inches, with help
35	3	catching large ball, elbows in front of body, no success or success on one trial
35	2	walking circle, 1 to 3 steps off
34	2	catching large ball, arms straight, success on 2 or 3 trials
34	2	descending long steps, mark time, unsupported
34	3	jumping 12 inches, alone, feet together
34	3	ascending small ladder, alternate feet, with caution
33	2	ascending large ladder, mark time, with facility
33	3	throwing small ball, both hands or one hand, distance 3
33	3	jumping 8 inches, alone, feet together
31	3	ascending long steps, alternate feet, with support
31	4	ascending short steps, alternate feet, unsupported
31	2	jumping 18 inches, alone, one foot ahead
31	2	walking path, 1 to 3 steps off
30	2	throwing large ball, both hands or one hand, distance 2
29	2	throwing small ball, both hands or one hand, distance 2
29	3	ascending short steps, alternate feet, with support
29	2	ascending long steps, mark time unsupported
28	2	descending short steps, mark time, unsupported
28	1	walking circle, 4 to 6 steps off
28	1	walking path, 4 to 6 steps off
24	4	bouncing small ball, one hand, distance 1
24	2	ascending short steps, mark time, unsupported
24	1	jumping 18 inches, with help
24	2	jumping 12 inches, alone, one foot ahead
24	1	descending large ladder, mark time, with caution

The motor ages are considered tentative and are subject to revision in the future. With the present data it did not seem advisable to refine the computations to decimals of a month.

It was impossible to assign motor ages to some subheads of certain skills because of the fact that the ages included in the study were not sufficiently high, or low, as the case may be.

A comparison of the results obtained on the items in this study which are similar to those of the Bayley (1) study, with the results obtained by Bayley on those items, is interesting:

Bayley found that children could walk up-stairs alone marking time at 24.3 months of age. Her stairs had only two steps and the landing platform. This would be slightly comparable to the short flight of steps in the present study. The age for ascending the short flight marking time unsupported in this study is 24 months.

Bayley found that children descended the steps alone marking time at 24.5 months. Twenty-eight months is the age assigned that skill in the present study. This age might have been lower had the flight of steps been as short as that used by Bayley.

She found that the age at which children could walk on a chalk line 10 feet in length was 31.3 months. She credited the child if he walked near the line, usually stepping on it with one foot, or astride it for the entire length. In this study the child was asked to walk a 1 inch line 10 feet long and was credited according to his ability to stay on the line. The motor age for the lowest score on this skill, four to six steps off, in the present study is 28 months, one to three steps off is 31, and no steps off is 31 months. No steps off in the Bayley study is accredited a motor age of 38.5.

In Bayley's study the motor age for jumping 12 inches with feet together is 37.1 months. In the present study the motor age for this skill is 34 months, and the age for jumping from that height with one foot ahead is 24 months.

Hopping on one foot for two or three hops is given a motor age of 49.3 months in the Bayley study. In the present study the motor age for that skill is 43 months.

In this study the motor age is 49 months for descending the short steps alternating unsupported. Bayley's motor age for this skill is 50 months.

With the exception of descending the short steps alone marking time, the motor ages are slightly lower for each skill in the present study than in the Bayley study. There is agreement in relative placement if not on exact age in the two studies. The agreement is close considering the fact that the number of children at the two-year level in this study was so small.

SUMMARY AND CONCLUSIONS

The purpose of this experiment was to study some common motor achievements of children at the preschool ages.

The activities selected for study were: ascending and descending long and short flights of steps and large and small ladders; catching, throwing and bouncing large and small balls, jumping, hopping, skipping, and balancing on path and circle. Scores were assigned to the various stages of skill in each performance according to their difficulty as evidenced by the percentage of children at each age who accomplished them.

The devised tests were given to ninety-eight children in attendance at the preschool laboratories of the University of Iowa. The age range was from twenty-six to seventy-four months. Of these ninety-eight children, forty-six were retested the week following the original test in order to determine the reliability of the tests. The coefficient of correlation was .98 $\pm$ .004. Three-fourths of the children changed less than three points in score.

In order to obtain a range of scores sufficiently large to give significant correlations, the various skills were combined into partial score groups, under (1) steps and ladders activities; (2) ball activities; (3) jumping; and (4)

hopping, skipping, and balancing series.

Correlations between these partial scores for each sex, age range two to six years, are high and have a spread from .54 to .79. For the age range of twenty-six to fifty-three months, the correlations range from .40 to .75. The correlations between the partial score for jumping and each of the other partial scores were based on ages twenty-six to forty-eight months. They are high for both girls and boys, .72 to .84. Correlations run on the girls' age group from forty-two to fifty-three months and excluding the jumping series are lower, from .28 to .32. This was a narrow age range and there were only twenty children.

There is a significant gain in ability from one age group to the next, with a few exceptions. On the total score the only exception is between five and six years. The critical ratio between the three- and four-year-olds on the partial score for steps and ladders is 2.20. All other ratios between three- and four-year-olds are significant. The ratio between the four- and five-year-old groups on the partial score for ball activities is 2.42, for jumping 2.13, for hopping, etc., 1.67. These ratios are probably affected by the relative percentage of boys and girls in the groups. The ratio between five- and six-year-old groups approaches significance only on the partial score for ball activities. Here the ratio is just 3.00. The lack of difference on the other skills is explained by the fact that the majority of the children at the five- and six-year levels have reached approximately the maximum ability in the activities used in this study, with the exception of ball activities.

Boys appear to be somewhat superior on steps and ladders and ball activities and girls on hopping and skipping. The number of cases at each age level is small, but the results are quite consistent for the different age groups.

There is little or no correlation between ascendance scores and the motor scores of the three- and four-year-old children used in this study. The age range is from thirty-seven to fifty-nine months for these groups. The correlation for the three-year-old group is .006 and for the four-year-old group .27.

Motor age assignments were made for each stage of each skill according to the point at which 50 per cent of the group fail and 50 per cent succeed. Seventy-three such stages were assigned motor ages. These age assignments are considered tentative and are subject to revision after further testing.

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FEARS: THEIR CAUSE AND PREVENTION

GEORGE LAWTON[1]

Fear is the most universal of human experiences. But while it sometimes leads to a good result: escape from danger, most of the fears of civilized life are totally out of proportion to any danger involved. As such they always reduce efficient adjustments and often ruin lives.

The greatest number of fears arise in childhood in the course of the child's everyday activities. For that reason, adults can do a good deal to prevent fear from entering a child's life, or, to shorten its career, if it already has taken root. Many fears are either wholly avoidable or else can be removed by simple measures when noted early enough.

We sometimes think a person is unafraid because he does not show fear in its typical form, or because, as in the case of a very young child, he cannot say he is afraid. Even an older child who knows the words is not always aware that fear is the cause of his unhappiness, though this is apparent to the adult who has learned to correctly interpret the tell-tale signs of distress.

A fear may be thought of as simple when it is evoked seldom and for a relatively short time, and when it effects only a small portion of the individual's personality, for example, a fear of thunder or lightning. Fears are complex when they are experienced for a long time in an intense form and when, as a result, a considerable part of one's emotional and intellectual life is damaged and everyday activities are handicapped. To dread contact with dirt is an instance of such a fear.

Generally speaking, simple fears are found in children and young people, while complex fears are seen in adults. Fears do not all arise in the same manner and are not to be treated the same way. In order to prevent or remove a particular fear, it is important to learn something about the class to which it belongs.

In what follows, fears are arranged in an order of ever increasing complexity from infancy to maturity.

I

The first type of fear which a human being is likely to manifest are the "conditioned" fears, those which are built upon or associated with instinctive fears. Our discovery of the manner in which they develop makes a dramatic story, the first part of which takes place in Russia some thirty years ago.

Pavlov, the great Russian physiologist, is indirectly responsible for our knowledge of conditioned fears. As a physiologist, he was very much interested in the process of salivation in dogs. An animal would be fed, a certain amount of saliva would be produced and this would be measured. Pavlov noted a strange thing. After the experiment had gone on for a time with a particular dog, the latter's mouth would begin to water as soon as he saw the dish of food, or saw the attendant who brought the food, or even when he heard the attendant's footsteps in the next room. Now, salivation at the taste of food is an automatic reaction or reflex. When such an automatic reaction occurs in the absence of the original stimulus because of something associated with the latter, we get an artificially manufactured or "conditioned" reflex.

Pavlov generated and extinguished such conditioned reflexes in the simplest of ways. He would sound a buzzer and then feed the dog. In the course of several days training, the animal would begin salivating merely at the sound

[1]From New York City.

of the buzzer. But the dog could also be "unconditioned". During several successive experiments, Pavlov merely sounded the buzzer and did no more. After a time, the dog stopped salivating at its sound: "no food, no saliva".

The second part of the history of "conditioned" fears takes place in the United States. John B. Watson, the noted American psychologist and founder of the school of psychology called Behaviorism, some years after Pavlov's initial experiments had begun, sought to determine what actions of human beings might be called instinctive. It seemed to him that the only way to attack the problem was to study new-born infants and discover what reactions appeared before any learning had yet taken place. Working with a large number of infants, he concluded that there were only three types of behavior patterns that might be called instinctive or unlearned: fear, rage and love.

It had been generally held that many of the adult's extensive repertoire of fears are inborn. But when Watson went to the nursery to put this belief to the test, he found that infants could be frightened by only two things: the sudden loss of support and a loud sound.

Having ascertained these basic fears, Watson applied to their study Pavlov's discovery of the conditioned reflex. He was able to show that children acquire a great many fears through a process of conditioning, and could be made to lose them through unconditioning. Anything which accompanied the instinctive fears would become associated with them in the infant's mind and thereafter, coming of itself, would be sufficient to arouse the fear reaction. For example, a youngster given a bunny at the time of a crashing sound might then and there develop a fear of furry animals. Another baby, allowed to slip from one's grasp when given a bath, might henceforth be afraid of water.

To be able to treat human beings as Pavlov had treated dogs, to implant fears and then eradicate them, was naturally an exciting prospect to Watson. Before him opened a tremendous vista of manipulating human emotions and behavior and reconstructing human nature, to which possibilities he has devoted many glowing and eloquent pages. On these prophetic flights we cannot follow him, since here we must confine ourselves to the narrow subject of fear, and consider how it was trained into one little tot.

Albert was an extraordinarily good baby, eleven months old, who had never cried, at least not until Dr. Watson began his experiments and wanted him to cry. Albert first showed by repeated tests that nothing could frighten him but loud sounds and being allowed to fall. He had been playing for weeks with a white rat. One day, however, just as he reached for the animal, a steel bar immediately behind his head, three feet long, was struck with a carpenter's hammer. Albert jumped violently and fell but did not cry. These experiments were continued day after day with a combined stimulation of rat and sound. Gradually a fear response was built up, so that when the rat was presented alone, Albert instantly jumped, began to cry and tried to crawl away on all fours as fast as he could.

This much was clear, then. Any object associated with an instinctive fear could in time be the cause of fear. But there was still another point to be settled, namely that of determining to what extent the associated or conditioned fear response could be carried over to similar objects. If Albert had been given a fear of rats would be be afraid of all furry objects? For weeks Albert had been playing happily with rabbits, pigeons, fur muffs, the hair of the attendant, and false faces. Would his fear carry over? Each of these objects was presented in order, and toward all Albert responded by whimpering, crying, crawling away, though when a moment later his blocks were given him, he played contentedly with them, smiling and laughing. Albert thus was left with a fear of all things furry, acquired through a spread or transfer from the original fear.

Most children and young people and many adults remain in the early stage where they are afraid of all objects within a certain class, just because of a

superficial resemblance. Our superstitions illustrate this very well.

How shall we proceed to remove those fears acquired through association with instinctive fears? Certain common but inadequate measures of dissipating them are presented first.

Many persons believe that preventing any contact between the object feared and the child will result in the latter's "forgetting" his fear. A typical remark is "Just keep him away from it and he'll outgrow it." This method is not usually effective. The child afraid of a rat is likely to remain that way even though he may not see it for a long time.[2]

Another method in general use is to discuss the fear with the child. For example, a little girl of five is afraid of rabbits. For a number of days, she is shown no rabbits but receives instead a ten minute talk about them. She is given a picture book of Peter Rabbit, a toy rabbit and several rabbits modeled from plasticine. At the end of a week of such conversations and stories, she is shown the rabbit again. Her reaction is the same as it had been at the first encounter. Though she is willing to touch it while it is in the hands of the adult, no sooner is it released on the floor than she sobs, "Put it away, take it."

The method of discussion, therefore, is not promising with very young children, though, as we shall see with the next type of fears, it is often successful with older ones.

Some parents faced with a child who is afraid, say of water, will insist on the child's frequent exposure to his fear, believing that in this way the child will learn to overcome it.

This method seldom works and nearly always does mental and emotional injury to the child, only intensifying the fear, though the child may learn to conceal its outward manifestations in order to avoid parental criticism.

A common way of treating fears is to employ social pressure. The child who is afraid of any object of which his group is unafraid is called a "fraidy cat". A four year old was afraid of frogs. One day when he had been taken to an aquarium, a friend of his picked up a frog and turned to him with it. He screamed and fled. At this, he was chased and derided. But, as might have been expected, this in no way decreased his fear.

Ridicule is probably one of the most unsafe methods generally used for eliminating fears. It not only tends to increase the fear toward the specific object, but makes the child afraid of society as a whole. Since social relationships in his case are so often productive of pain, the child is likely to become shy and withdrawn. The little boy afraid of frogs may show his distress subsequent to the aquarium episode by furious thumb-sucking, tantrums or nightmares which parents are apt to consider ailments in themselves rather than signs of an unhappiness which at other times might have had other causes, but which here springs from fear.

If we are to introduce social factors in the attempt to eliminate fears, the method of imitation may yield better results than that of intimidation.

Bobby, thirty months old, was afraid of rabbits. One day while he was playing with two little girls, a rabbit was brought into his room. There was a momentary show of fear, but when his playmates dashed up to the rabbit and talked excitedly and with pleasure about it, Bobby instantly became interested in it, ran forward and wanted to see what it was all about.

On occasions such as the foregoing, the child should not be urged to watch or given a lecture on the difference between other children and him. It is enough to expose him to the sight of children who face without fear the objects or situations of which he is afraid.

One of the most successful methods used so far in removing fears in very

[2]The instances cited in this section are all taken from Dr. Watson's "Behaviorism".

young children is that of unconditioning. If fear can be trained in, it can be trained out; conditioning may be neutralized by unconditioning. But first we should ascertain, if we can, whether the object feared is the original one (the rat) which had become associated with the instinctive fear response (loud sound) or whether it is one which because of its resemblance (bunny) to the object (the rat) had awakened the fear response.

Peter, a three year old, was afraid of all furry objects, his fear having originated in an adventure with a rat. Peter's fear was handled in the following manner: One day, while he was seated near a small table in his high-chair having lunch in a room about forty feet long, a rabbit was displayed in a wire cage, just far enough away not to disturb his eating. On succeeding days the animal was brought closer and closer until it could be placed on the table, then in Peter's lap. Finally the child would eat with one hand and stroke the rabbit with the other. With the disappearance of his fear reactions to the rabbit, Peter's fear of cotton, fur coats, and feathers was entirely gone.

Another useful method depends on the fact that the child should not merely sit still and learn to tolerate a feared object, but in the case of certain fears should be able to act positively and attack the fear situation by himself. He may be led to do this if such a direct facing of his fear is the only way he can get something he wants very much. The incentive, however, should not be presented as a reward or bribe.

This method was successfully applied in an experiment with a small group of children who were afraid of height. Each one was able to walk across a plank in mid-air when a box of toys and games was placed on the board opposite the starting point. In a similar manner children who were afraid of dark places were led to enter the room when, during the course of a game, a ball was thrown into the room ostensibly by accident, and it was the child's job to go after it.

II

The second class of fears are those which are the aftermath of unpleasant experiences. Because of a tyrannical first-grade teacher, a youngster may develop a fear of school. A child bitten by one dog may fear all others. Many of us have acquired a fear of doctors or dentists through a painful initial contact. A very clear example of this type of fear is shown by a young woman who always became terror-stricken at the sound of running water. Her fear was inexplicable until the following story was unfolded: As a child of six, she had fallen off a river bank and had become wedged in between some rocks of a small waterfall. Her aunt, with whom she had gone walking and who had wandered off, found her hours later. In response to the little girl's plea that the episode be kept from her parents, the aunt promised "I shall never tell." Children are sometimes afraid to have their parents find out about a frightening experience in the belief that the parents will assume it was the child's fault that the incident occurred and that they will be scolded. Circumstances thereafter took the aunt to another part of the country. The girl completely forgot the experience and it was only years later, upon a chance meeting with the aunt and the latter's resurrection of the incident, that the fear was cleared up.

A girl of twenty, otherwise normal and happy, suffered from fainting fits. These occurred only when she opened a package containing flimsy wrapping paper or when a window curtain blew in her face. For years the young woman had feared chance contact with gauze-like materials without any idea of the basis for this fear. Then one day she recalled an incident that had been completely forgotten. When she was seven she had been suddenly awakened from

a sound sleep one evening to find hovering over her a friend clothed in a bed-sheet to resemble a ghost. And with this recollection came release from her thirteen year-old fear.

Children who have been under the influence of someone with an irritable temper or witnessed attacks of violent anger, may develop a deep fear, even when the anger has been directed at another person. Such a youngster may jump at sudden sounds or loud voices and will regularly search faces for signs of approaching danger. If he believes his suspicions are about to be realized, he may run and hide rather than face the imminent storm.

Youngsters who have had many unpleasant experiences become generally anxious and insecure. Everything novel and unexpected, whether of places or people, is likely to arouse great apprehension. Thus arises frequently the abnormal shyness with strangers which some children show

One way of lessening the effect of fears resulting from painful experiences is to anticipate the difficulty so that the child does not have to meet his fears alone or without moral support. It is true that a child should know it is sometimes inevitable for him to enter a fear-producing situation and that no one else can take his place when this happens. Yet he also should know that he can call upon adults for assistance, conversational and otherwise, when necessary.

Another useful device is to have the child repeatedly encounter the feared object or situation under circumstances that tend to lessen the object's fearfulness. A substitute or imitation of the dreaded object may be the means of doing this. The child afraid of animals ought to be taken on frequent trips to the zoo or given a small pet of his own.

A four-year-old boy was rescued from a burning apartment one evening by his nurse, who was the only person with him at the time. The resulting fear was handled by giving the youngster a toy fire engine which closely resembled the real thing, even to the extent of a hose which threw water a distance of twenty feet. In the course of extinguishing his little make-believe fires, he was able to talk freely about his experience, and the effects of the fright gradually wore off.

A fear rooted in an unpleasant experience may be removed in time if the child's attention is frequently diverted by associating something pleasant with the feared object or situation. A child who is afraid of water may forget his fear while he plays with a new sailboat.

III

The largest group of fears are those which are acquired through direct imitation of those who are afraid. Fears can be caught like colds. Parents and other adults in the home are the chief sources of contagion, with brothers and sisters, playmates, teachers, stories, radio programs and motion pictures, next responsible, the last two usually potent forces only if the child is already a fearful one or if his attention is especially called to certain incidents. Fears also may be picked up through indirect imitation. A child entering a class afraid of a teacher or coming into a courtyard of children fleeing from some bully, is likely to share the fear.

One can take a child destined for a normal emotional life and by using threats as disciplinary devices breed in him an immense variety of fears. "The bogy man will get you in the dark." "The policeman will put you in jail." "The doctor will cut off your ears." It has been found repeatedly that the root of a child's fear has been a threat, made in haste or anger, and then forgotten by the person making it, although not by the child. Temporary obedience and peace in the household may be obtained by such means but

only at the price of later emotional difficulties for the object of the threat. In similar manner, teachers are sometimes liable to use sharp and scolding speech, believing that the way to make a child succeed is by scaring him with pictures of the dire failure that awaits him in and out of school unless he mends his ways.

Youngsters are surrounded by many dangers today and frequent injunctions to be cautious are therefore in order. But this should be done through matter-of-fact discussions of the necessity of vigilance. The adult who uses fear as an educational technique, painting lurid pictures of what will happen if the child plays with matches or ignores traffic signals, runs the risk of creating a Frankenstein. Such warnings may or may not prevent mishaps, but even if bodily harm is averted, considerable mental injury may be inflicted. And should the child unluckily meet with an accident, the parent is not likely to help him much in regaining confidence once he is well again. Instead of making him cautiously courageous, in the natural anxiety to forestall a re-occurence, such a parent may only increase his dependence. The youngster often wants to start afresh emotionally, but the parents are the ones who remind him of what has happened.

Children are told or overhear frightening stories involving snakes, mice, worms, etc. In superstitious families, children imbibe a host of superfluous fears and dreads. They are taught that an eye or nose which itches, a black cat, a broken mirror, the thirteenth floor--these, and a thousand other similar facts, all portend evil. Three generations of a particular family exhibited a great fear of toads, the fear being bequeathed from mother to daughter like some precious heirloom.

Many persons find it difficult to keep their emotional distress concerning certain themes from becoming known to their children. Without deliberate intent or awareness, they may therefore systematically teach their children a dread of ill-health, death, doctors, hospitals, or even of life itself.

A mother will unwittingly train her daughter in future attitudes by methodically disillusioning her about love and marriage relationships. A father may often complain about the extreme hardship of earning a living or of the treachery prevalent in the business world. As a result, he instills in his son a fear of leaving home in order to make his own way. When such a father complains about a lazy, shiftless heir, he may not realize that "laziness" and "shiftlessness" are signs of mental ill-health, which has its roots in fear and insecurity.

Though many parents perform herculean labors in keeping their private woes to themselves, it is admittedly very difficult to avoid subjecting children to the indirect effect of fears. Youngsters are wonderfully sensitive to gestures or facial expressions and at an early age become experts in interpreting them.

When we come to methods of handling imitative fears, we find that the most important of these apply to the grown-up himself.

Adults should try to recognize their own fears and avoid discussing them with children in their charge. That they should wish to talk about them is natural. But this should be done with persons their own age and only when youngsters are out of earshot. However, should adult fears reach such a point that young people can no longer be shielded from constant and direct contact with them, the grown-ups involved would be wise to have their own emotional difficulties cleared up.

As for the child himself, one can try to surround the feared object with pleasant associations. A joke directed at it may allay tension, though it is true that this is likely to be effective only in the given emergency. Where the child is able to understand, a better method is to explain to him the origin of the different kinds of fear, especially of the imitative type. The scientific explanation, but simplified to whatever degree necessary, is also in order in the

case of fears connected with natural phenomena, like thunder and lightning, which are acquired for the most part and not inborn. The same tactics should be used with fears arising from old-wives tales.

IV

One of the most important class of fears is that concerning one's importance in the social group. Here arises the sense of inadequacy which always has had a local habitation, though it is only recently that it has secured a name: inferiority feeling. The sufferer fears defeat in situations where he must meet social scrutiny and obtain social approval. This type of fear has its roots in the first years of life, though it does not begin to show itself clearly until late in childhood and does not develop in the most mature form until adolescence.

The chief cause of the feeling of inferiority is doubt regarding one's emotional status in the family. A child who thinks himself unloved and rejected by his parents or by his brothers or sisters cannot help but suspect that their low opinion of him is shared by others outside the family. Since so many others seem to think little of him, he begins to accept their evaluation of him as his own.

The insecure child dreads the emotional loss of his parents. In order to prevent this calamity, than which there can be no greater in his entire life, the child tries to bind them fast. He may do this through infantile and immature behavior or through a form of naughtiness which Dr. David Levy has aptly called "dependency aggression". He is always seeking his parents' attention because such attention is to him a symbol of their love.

What is commonly regarded as a superficial fear, that of the dark, is actually of considerable significance. For the fear is never of the dark in itself, since there is no proof that children are born with such a fear. Sometimes, what is frightening is not the dark but what has happened in the dark or what the child, through stories and threats, has been led to believe will happen there. However, darkness may have a still deeper meaning. To the child, it comes between him and those he loves. Because of it, he cannot see if his loved ones are near, nor can they see him, and to the young mind, what cannot be seen, no longer exists. An insecure child naturally is afraid of all separations and especially of the isolation which darkness brings.

A youngster will betray his insecurity in school by dependent behavior, just as he did at home. The child with a feeling of inferiority is shy and timid in a group. He refuses to recite in class, even when he knows the right answer, because he dares not compete with his contemporaries. He may stutter and blush. He withdraws into to himself and becomes a day-dreamer. Occasionally, instead of retreating he attacks and becomes anti-social and over-aggressive, all as a result of his fear. He says to himself: "They don't like me, but I'll make them"; or "They will attack me, but I'll do so first", and we therefore always find him fighting either for recognition or in imagined self-defense.

Since fear concerning the social verdict on the worth of one's personality affects a greater area of the individual's emotional life than do any of the others discussed thus far, the remedy for it is more complex.

If a child is afraid to meet social situations, that is, if he is shy, timid, and feels inferior, he can be helped only to the extent that there can be restored to him a sense of importance in the social group. This is possible only when the child, intellectually and emotionally, is certain he possesses his parents' love and support, in spite of his momentary shortcomings or delinquencies. He ought to feel that he is liked, just for himself as a person. Every child has as his birthright, a claim to expressions of warmth and tenderness. He has even greater claim to being brought up among adults who show they have full

confidence in his ability to conquer all of life's problems as they come along. Such a child is not likely to develop any fears regarding his social status. On the other hand, a child who is shy, dependent or "dependently aggressive" because he is fearful, will become only more insecure if these surface symptoms are met with ridicule or punishment.

Anyone faced with a timid and insecure child should be alert to recognize and praise all of his positive achievements and attempts at self-assertion, however slight. Criticism should be forthcoming when necessary, but should be forward-looking rather than backward, emphasizing the greater possible success and not the failure. With such a child one should take special care to see that he is placed in a group of equals where he can be given tasks within his powers of achievement. In this way, one insures at least the possibility of successful competition.

V

Thus far, we have considered fears of a specific, particular character, which can be thought of as a kind of mental growths developing by themselves in a small, limited area and as such yielding to simple techniques of removal. There are other fears, which also seem specific and particular, bearing a superficial resemblance to the first kind, but which cannot be removed except with considerable difficulty, since they spread their roots into wide areas of the personality and the emotional life. For this reason, such intense fears are called "morbid" fears, phobias or dreads. Examples of these are found in persons afraid of high places, open and closed spaces, blood, dirt, sin, poisoning, etc.

These fears are neurotic or symbolic fears as distinguished from the previous classes, more or less real fears, and a campaign or re-education by the untrained person is not likely to prove so successful as in the case of the fears described earlier.

In a neurotic fear, the object we think we fear is merely a symbol for an impulse or a situation we really fear. The conscious thought of this true fear, would fill us with too much emotional distress and that is why we have to face it indirectly. This type of fear, therefore, is a pictorial representation of a concealed conflict; a wish and an unwillingness to attempt the gratification of the wish. The fear of falling from windows or precipices or jumping from bridges or high places may mask a desire for self-destruction. The fear of streets may be really the fear of life and of the temptations which beset one outside the home. Moreover, such a dread may be basically a fear of separation from a loved one and is still another way of exerting power over members of one's family, just as in earlier years, a child's fear of the dark may sometimes actually be a fear of losing one's mother and a device for obtaining her love. Fear of school examinations frequently is a neurotic fear, where what the individual fears is not the examination, but this only as it symbolizes a test of his personal validity and an inquiry into his private life.

It is generally believed by psychologists that a phobia results from an intense fear experience to which a sense of guilt has subsequently become attached. Phobias are rarely found in children. But an ordinary fear may develop into one, and that is why no childhood fear should be allowed to persist.

The most serious type of neurotic fear is anxiety. This is characterized by a great sense of inadequacy and a feeling that nothing in life is worth while, as well as by intense irritability. Indecision about trivial matters becomes so great as to paralyze all activity. It is not a particular action itself which is dreaded so much as the consequences, seemingly almost fatal, of making an error.

Anxiety is sometimes associated with specific objects or conditions, such as

school performance, one's job, cleanliness, the imminence of disease or illness, going outside after dark, leaving tasks unfinished. In its most typical form, however, anxiety is no more than a vague persistent uneasiness, a sense of impending doom and disaster, that is even more painful and unendurable because one does not know just what it is that he fears. The sufferer seems to be walking day after day along the edge of a cliff blindfolded. All that he knows is that an awful imponderable, a Something will happen either to himself or to his kin.

Anxiety states, like phobias, are neurotic or symbolic fears, where the surface fear is not the true fear and where all the bewildering symptoms represent a code language, the meaning of which is revealed only by specialized psychological techniques. Besides being painful, there is always the possibility that this generalized fear may be communicated to any young person coming in intimate contact with the sufferer.

Suppose we try to sum up some of the general principles involved in the treatment of fears:

Free discussion of all phases of the fear should be encouraged, though it should not be forced. In the case of young persons, one cannot break down the door which leads to the mind of a child; nor will three loud knocks cause it to swing open on its magic hinges. One must wait outside it patiently, until it opens of its own accord. And, of course, this is true of many adults as well. When the sufferer is certain he has a sympathetic audience, he may be willing to talk about his difficulty, provided he himself is aware of the thing really feared. At this time, an attempt should be made to determine the history of the fear, again on the assumption that the fearful one can recall it just by trying to remember.

Some of the simple measures indicated in this article may be tried. Ordinarily they should prove sufficient, if one remembers that repetitions of a particular procedure are nearly always necessary and that emotional re-education is a slow and gradual process. However, where fears are of long standing, their treatment by means of recipes in the family medicine chest is of limited success. This is especially true where the fear is only a surface expression of some deeper unrest and hence relatively unimportant in itself; it is true also in those instances where the individual is unable to recall any of its history. When a fear persists, proving unresponsive to any elementary technique, it may be necessary to invite the assistance of a psychologist or psychiatrist in order to unearth this deeper difficulty or facilitate the recall of the fear's origin.

For a human being to go through life without experiencing fear in some form is hardly possible, and not desirable, could it be achieved. The derivatives of fear is the shape of caution, foresight and a careful weighing of hazards are essential elements in a well-regulated existence. The devices sketched here are ways, not of uprooting and destroying a powerful emotion, but rather of bringing it back under control whenever it has gotten out of bounds. With the progress of psychological science, we shall become ever more resourceful in learning how to place fear under the domination of the intellect and thereby utilize to the fullest what can be one of the most constructive forces for the development and enrichment of the personality.

AN EMPIRICAL CONCEPT OF PHYSICAL GROWTH

HOWARD V. MEREDITH[1]

The "Physical Growth of the Child" is a sector of scientific inquiry which engages the teaching and research abilities of numerous individuals. These individuals are concerned with studying and describing the human child, at successive stages of its life span, in terms of physical or bodily characteristics. Many of them are giving particular attention to the physical growth of the normal or nonpathological child.

As one engaged in instruction and research relating to the physical growth of the normal child, the writer has found himself recurrently confronted with such questions as: What is physical growth? How, if at all, does physical growth differ from physical development? In the event that an important distinction exists between growth and development, are age changes in body proportions manifestations of the former or of the latter?

GROWTH AND/OR DEVELOPMENT

The committee on growth and development of the White House Conference on Child Health and Protection claimed:

> "We use the two terms, growth and development, advisedly as there is a useful and significant distinction between them. By growth we mean increase in size. As opposed to this, development implies an increase in complexity, such as we see in the formation of the four-chambered heart of the infant from the simple pulsating tube of the embryo. It is possible in many instances to have considerable development with very little growth in size. This obviously occurs during the first days following the fertilization of the ovum, before implantation has occurred..."[2]

Lawrence K. Frank, in a 1936 paper under the caption, "What is growth?" stated:

> "...we have already used the two words 'growth' and 'development.' It is important to distinguish clearly between these words...growth means simply the process by which one cell undergoes self-multiplication, the result being that two new cells are generated or produced....development implies much more than growth alone, for development really consists of three important processes; first, growth which forms new cells by self-multiplication of preceding cells; second, differentiation of these cells as regards both structure and action (i.e., specialization as bone, muscle, nerve, blood, and other cells); and third, the organization of all the parts which growth and differentiation have produced."[3]

The incompatibility of the two citations is too apparent to need extended

[1]From Iowa Child Welfare Research Station, State University of Iowa, Iowa City, Iowa.

[2]White House Conference on Child Health and Protection: Growth and Development of the Child, Part IV, Appraisement of the Child. I. Mental Status, II. Physical Status. New York: Century, [c. 1932] Pp. xix, 344. (p. 4)

[3]Frank, Lawrence K.: What Is Growth? Radio Forum on Growth and Development of the Child, 1936-1937, 2-3. (Mimeographed)

elaboration. It will suffice to note that the cleavage stage of the organism is employed by the White House Conference committee as a crucial instance of development --

> "It is possible in many instances to have considerable development with very little growth in size. This obviously occurs during the first days following the fertilization of the ovum..."[4]

and by Frank as a clear manifestation of growth --

> "...growth begins in the egg...this cell becomes separated into two cells... These two then separate again into four, into eight, into sixteen, and so on, by a constant process of self-multiplication."[5]

A somewhat different approach to the establishment of a distinction between growth and development has been made by Harold C. Stuart. To quote:

> "Just as mankind has slowly developed through the ages, so each individual man must start as a single fertilized cell and must pass through a great variety and number of stages before he reaches maturity. These stages repeat to a certain extent the history of the development of his species. The term development properly refers to this process of change from the single cell to the complex mature adult, in contrast to growth which refers to simple increase in size. If a child merely grew larger, using the word in this sense, a baby would be a small reproduction of a man. If he merely developed, man and child would be alike in size, though very different indeed in capacity and proportions."[6]

The first question to arise from a reading of this quotation is whether any meaningful or useful purpose is attained by attempting to abstract "simple increase in size" of the human organism from the "process of change from the simple cell to the complex mature adult." Additional questions present themselves when one carefully considers the statements made with reference to development. On the one hand, development appears to be defined as change in complexity. Here it would seem to imply such phenomena as change from a unicellular organism to a multicellular organism; change from a two-germ-layer organism to a three-germ-layer organism; change from an embryonic disk consisting of merely cephalic and trunk regions to a fetus with articulate internal organs such as brain, heart, and liver, and external features such as upper and lower extremities, digits, nose, and ears; change from a newborn infant lacking calcification of the permanent teeth, ossification of the carpal bones, and heavily pigmented axillary and pubic hair to an adolescent with all these items of complexity. On the other hand, development is referred to as resulting in marked changes in proportion. Here it would seem to cover such changes as the lengthening of the trunk in relation to head and neck length, the lengthening of the legs in relation to the arms, the widening of the thorax in relation to its depth, the lengthening of the hands and feet in relation to their breadths. It would appear, then, that Stuart's discussion of development tends to confuse the emergence and submergence-or-loss of parts (changes in complexity) with the varying rates of change within and between parts (changes in proportion).

Helen Thompson, in 1934, defined growth as a three-aspect process of

[4] Loc. cit., p. 4.

[5] Loc. cit., p. 3.

[6] Stuart, Harold C.: Healthy Childhood: Guidance for Physical Care. New York: Appleton-Century, 1933. Pp. 393. (p. 53)

augmentation, differentiation, and integration. She wrote:

> "Growth is commonly conceived of as a process of augmentation and differentiation. ...Another concept such as conjugation or integration is necessary for an adequate interpretation."[7]

This definition is obviously similar to that given by Frank, not for growth, but for development.

> "...development really consists of three important processes; first, growth which forms new cells by self-multiplication of preceding cells; second, differentiation of these cells as regards both structure and action... and third, the organization of all the parts which growth and differentiation have produced."[8]

Frederick S. Hammett recently expressed the view that "proliferation, differentiation, organization, and mass increment" are all manifestations of growth. For him:

> "... growth is not single. It is multiple, the combined expression of developmental and incremental factors. Increase in cell number is as much growth as is increase in cell size. Increase in cellular specialization is as much growth as is increase in cellular segregation."[9]

Hammett and Thompson each use the term growth to the exclusion of the term development. Their definitions of growth are in general agreement, and are similar to Frank's definition of development.

When one turns from the available attempts at definition to a direct examination of research reports, it is no less difficult to discover any manifest difference between growth and development. The type of problem investigated is the same for studies claiming to describe various phases of the physical growth of the child as for studies claiming to treat the physical development of the child. In the same sense that one investigation uses "progression of development" another uses "growth with advancing age," in the same sense that one uses "growth period" another uses "stage of development," in the same sense that one uses "phase of development" another uses "aspect of growth," in the same sense that one uses "growth curve" another uses "developmental trend," in the same sense that one uses "course of development" another uses "course of growth," and in the same sense that one uses "growth sequence" another uses "developmental pattern."

Many investigators use the terms growth and development interchangeably. Thus, for instance, Baldwin, Busby, and Garside wrote:

> "The function of students of growth and development is clear, that is, to trace and analyze specific traits of growth, constantly seeking broader and more fundamental principles of development."
>
> "The data for the study were collected...with a view to discovering some basic principles of anatomic growth from the development observed in the bones."[10]

The complete interchange of terms is unequivocal. These authors considered they were, at once, studying "traits of growth" to discover "principles of de-

[7]Thompson, Helen: A Third Aspect of Growth. Human Biol., 1934, 6, 405-407. (p. 405-406)

[8]Loc. cit., p. 2-3.

[9]Hammett, Frederick S.: Introduction to Growth. Growth: A Journal for Studies of Development and Increase, 1937, 1, 1-2. (p. 1)

[10]Baldwin, Bird T., Busby, Laura M., and Garside, Helen V.: Anatomic Growth of Children: A Study of Some Bones of the Hand, Wrist, and Lower Forearm by Means of Roentgenograms. Univ. Iowa Stud., Stud. in Child Welfare, 1928, 4, No. 1, Pp. 88. (p. 5)

velopment" and studying observed development to discover principles of growth.

It appears, then, that no "useful and significant distinction" has yet been drawn between the physical growth of the child and the physical development of the child. Those whose task it is to synthesize the research literature do not find it "useful" or practicable to subdivide their materials into "Studies on Physical Growth" and "Studies on Physical Development." Likewise, those whose task it is to make original investigations neither distinguish between problems of growth and problems of development nor consider it "significant" to attempt the formulation of diverse procedures for attacking problems of growth and problems of development.

AN EMPIRICAL CONCEPT OF PHYSICAL GROWTH

What is physical growth (or physical development)? From the empirical standpoint, physical growth is that body of findings which is studied and cumulatively extended by investigators of physical growth. In other words, it is the total series of bodily or structural changes found to characterize the ontogenetic life history of the individual. The series of physical changes thus far described for the human child may be subdivided, in the writer's opinion, into changes in size, changes in complexity, changes in proportion, and changes in pigmentation and texture.

CHANGES IN SIZE

Individuals concerned with describing the physical growth of the child have given considerable attention to change of the organism in size. They have studied changes with age in stature, sitting height, head length and breadth, width of shoulders, width and depth of thorax, girth of arm and leg, surface area of trunk, transverse diameter of heart, weight of thymus gland, and an extensive list of other characteristics. In so far as they have been scientists they have not set out to study increase or augmentation in size, but rather to study change in size regardless of the direction of the change. Moreover, they have not always found increase in size. Mean curves for antero-posterior diameter of the thorax register a slight decrease in the absolute magnitude of this dimension between two and three years of age, mean curves for weight of the thymus gland show a fairly marked descent during the second decade, mean curves for thickness of skin and subcutaneous tissue at front and back of the thorax exhibit a general decline for the postnatal age period from six months to six years, and mean curves for thickness of skin and subcutaneous tissue at front and back of arm show an increase for females but a decrease for males from around eleven years to the close of the second decade.

That the study of change in size during successive intervals of the life span constitutes a major aspect of physical growth appears evident from the amount of research which falls in this category and from the comprehensiveness of the approach that has been made to size change. Apparently it is hardly more axiomatic to say that the goal in the case of each physical measurement proposed for scientific inquiry is to discover the facts about this measurement than to say that one large sector of these facts has to do with change in size. This follows since in discovering the facts for change in size at least four master questions are frequently entertained. First, what -- under present conditions of life -- is the typical course, magnitude, rate, and duration of the sequence of change for this measurement? That is, does the measurement increase during certain intervals, decrease during others, and during still others remain constant? What is the average amount of the gain or loss from age

to age and what is the variability in gain or loss at each age? At what ages do maxima and minima occur in the rate curves for the measurement? Over what portion of the life span does the sequence extend? Secondly, what are the factors that may significantly modify the sequence? Is it accelerated or facilitated in relation to sex, diet, exercise, sunshine, and fresh air? Is it retarded or inhibited in relation to order of birth, housing and sanitation, disease? Thirdly, how is the sequence of change for this measurement inter-related with sequences of change for other characteristics of the organism? Does it synchronize with sequences for other physical measurements or with sequences for certain mental or motor functions? Does it systematically diverge from certain sequences? Fourthly, what constellation of factors produces the most desirable sequence of change for this measurement? How might the sequence be controlled in the interest of efficiency, poise, and longevity for the individual? How might the sequence be controlled in the interest of racial survival and betterment?

CHANGES IN COMPLEXITY

A second major aspect of physical growth is that of change in complexity. The human organism undergoes marked changes in its physical complexity, as well as its size, between fertilization and senility. It changes, for instance, from an embryonic disk of three germinal layers to an organism with articulate head, trunk, and heart; to an embryo with branchial arches, mouth cavity, limb buds, liver, and external tail; to a fetus with eyes and eyelids, nose and ears, fused upper and lower lips, digits and nails; to a preschool child with obliterated fontanelles, well-developed cervical and lumbar curves, a full complement of deciduous teeth, and osseous centers for almost all the epiphyses of the skeleton; to an adult with heavy axillary and pubic hair, deciduous teeth replaced by permanent teeth, epiphyses united to their respective diaphyses, and beard or breasts.

As in the case of size, it is essential to regard this aspect of physical growth as concerned with change in complexity and not merely with increase in complexity. Two examples will make this apparent. First, the osseous skeleton is more complex during the first two decades of postnatal life than either during prenatal life or in adulthood. At birth the osseous skeleton consists almost entirely of primary centers of ossification. At various times between birth and puberty about four hundred epiphyses or secondary centers make their appearance. Following puberty "the most striking feature in the growth of the skeleton is the knitting of the epiphyses with their shafts."[11] It has been estimated that the child's skeleton consists of roughly two hundred and fifty bony masses in early infancy, three hundred and fifty bony masses around puberty, and two hundred bony masses in adulthood. From the standpoint of number of skeletal units, the sequence is thus one of initial increase in complexity and later simplification or decrease in complexity.

Secondly, the dentition of the kindergarten child is markedly more complex than that in the newborn infant or the adult. The typical neonate shows no eruption of the deciduous teeth and no calcification of the permanent teeth. Around five years of age the child has twenty deciduous teeth fully erupted and twenty-eight permanent teeth almost completely calcified -- making a total of forty-eight in all. By fourteen years of age the deciduous teeth have been discarded and the dentition simplified to twenty-eight permanent teeth erupted and four permanent third molars almost ready to erupt.

Those who have defined development (or growth) as increase in complexity appear to have avoided their obligation to designate also the phenomenon repre-

[11] Excerpt from an address by Professor Richard E. Scammon.

sented by such items of decrease in complexity as submergence and loss in intrauterine life of the external tail and lanugo, absorption and loss in childhood of the deciduous teeth and in old age of the permanent teeth and alveolar arches, and the reduction between childhood and senility (due to epiphyseal union and suture closure) in the number of bony masses which comprise the skeleton.

CHANGES IN PROPORTION

It has long been common knowledge that the newborn infant differs widely from the adult in the configuration of his body. Probably the features of this difference in the infant's form or shape which have been most evident to the lay observer are his relatively large head, short legs, stubby hands, short face, and broad, low-bridged nose.

Moreover, rigorous study of the gradual modifications which occur with age in the proportions of the body is by no means unrecognized as a major aspect of scientific inquiry on physical growth. This is amply supported by the research literature on the physical growth of the child. Age-to-age changes in the ratio of one physical dimension to another have been studied by means of the cephalic index, the thoracic index, the intermembral index, the brachial index, the crural index, the stem-stature index, the hip-shoulder index, the facial index, the nasal index, the dental-arch index, and a long series of other indices.

Changes in proportion, like changes in size and complexity, do not take place solely in one direction. The thoracic index has been found to increase during the embryonic period, remain constant during the fetal period, decrease with the establishment of respiration, and increase during infancy. Findings for the ratio of hip width to shoulder width give a rising trend during fetal life and the first three postnatal months, a declining trend from three months to about one year of age, and a rising trend from one year to about four years of age. The mean curve for hip width in percentage of leg length has been found to rise to the third postnatal month and fall during the period from three months to six years of age. Findings for the index of leg length in percentage of stem length show an increase to around fourteen years of age and a slight decline between this age and the attainment of adult stature. Further citations are superfluous since the purpose here is only to illustrate the fact that certain changes in proportion fluctuate in direction from age to age. Investigators set themselves the task of determining the sequence or trend for a given proportion without regard to the course the trend may be found to take.

CHANGES IN TEXTURE AND PIGMENTATION

The fourth aspect of physical growth has been explored far less than the three aspects already discussed. It concerns changes during the individual life cycle in texture and pigmentation of the body tissues. Problems falling within this heading include changes with age in texture of bone, quality of muscle and subcutaneous tissue, texture of hair (e.g., change of pubic hair from fine to coarse at puberty), color of eyes, color of hair (including graying), and color and texture of skin. Numerous studies of eye color and hair color have indicated the general tendency to a darkening (increased pigmentation) of these characteristics during childhood.

SUMMARY AND CONCLUSION

The position that there is a useful and significant distinction between physi-

cal growth and physical development is found to be unsupported either by theoretical definitions of growth and development or by the research literature on the physical growth of the child. It is concluded that "physical growth" and "physical development" may be used (at least for the present) as interchangeable terms.

An empirical concept of physical growth (or physical development) is developed. According to this concept physical growth is the study of bodily changes which occur in a biological organism with advancing age. Applied to the human organism, it is the study of changes taking place in the size, the complexity, the proportions, and the texture and pigmentation of the body between the beginning of embryonic life and the close of senility.

The intended purpose of the paper will not be fully realized unless other workers see fit to evaluate the concept and to elaborate it or cite its weaknesses.

THE EFFECT OF NURSERY SCHOOL TRAINING: INSECURITY FEELINGS

RUTH ANDRUS AND EUGENE L. HOROWITZ[1]

Fundamentally involved in many theories of personality is the sense of security of an individual. Certainly nursery school practice is designed to develop within the child feelings of security which will serve as the firm base from which the growing personality may develop and expand in most desirable fashion. In spite of the many differences both in theory and practice, few educators of very young children would dissent from the statement that one of the goals of education is to increase the general security of the children (whatever differences may appear in their means to the end). We can not here undertake an elaboration or definition of security in more basic terms, for the present let us accept the concept without further analysis.

I

A rating scale (see page 170) was prepared by Miss Marion A. House and was designed to secure teachers' ratings on children in nursery school which would provide an index of the security - insecurity feelings of the individual children. Since the data collected for this study were available to the present writers, an analysis was undertaken of the relationship between nursery school experience and the children's ratings on this scale.

A priori analysis of the items of the questionnaire discloses that each item may be conceived as representing a "symptom" of insecurity (as customarily discussed from the psychiatric-educational point of view). The greater the frequency of the display of any of these symptoms, presumably the greater the insecurity of the child. Based on these considerations, a Likert-type scoring scheme was devised using numerical scores of 1, 2, 3, 4 and 5 for the corresponding columns, increasing score representing more frequent manifestation of symptoms, or, the higher the score, the presumably greater insecurity of the child. Where the X column was used, a score was assigned: the average of all the items not rated by a check in the X column, in order to permit direct comparison of scores assigned individual children.

These rating scales were distributed throughout the schools of the Nursery School and Parent Education Program of the Federal Works Progress Administration of New York State during March 1937. These scales were distributed with directions for their use (see INSTRUCTIONS TO RATERS) and ratings were applied by three people in each school for each child. The three raters were generally the head teacher, the assistant teacher, and the nurse. These schools are under the general supervision of one office with local schools under the more intimate supervision of a regional supervisor. In order to minimize the differences introduced by studying schools the educational policies of which are dictated by different individuals, seven schools under one regional supervisor were selected for the analysis here presented. Restriction of the time for the actual ratings to a period of two weeks reduced to a minimum difference in ratings due to the lapse of time.

These data are subject to all the limitations of the rating scale approach, nevertheless they are of some value although this may not be the face value. The first consideration in the analysis is reliability. Both the scale and the

[1]From Child Development and Parent Education Bureau, The State Education Department, The University of the State of New York, Albany. The writers wish to express their appreciation for the help given by Miss Marion House, WPA regional supervisor and the WPA nursery school teachers in collecting data as well as the assistance of G. E. Fisher and James Alger, WPA statisticians.

Form RES651

The University of the State of New York
The State Education Department
Child Development and Parent Education Bureaus
Albany

To be filled out by three or more raters, independently

To be filled out for each child by each rater

To be returned to E. L. Horowitz, Child Development and Parent Education Bureau, State Education Department, Albany, N.Y., by: _____

INSTRUCTIONS TO RATERS

1. Consult no one before making the ratings; make them as independent and objective as you possibly can.
2. Read the whole scale before rating any items.
3. In rating each item, disregard your ratings for that child on every other item; try not to let general impressions color your judgments about specific aspects of the child's behavior.
4. Rate the entire group of children on one item before rating on another item.
5. Use the back of sheets for specific comments, illustrations or noteworthy episodes that throw light on the ratings.
6. Be sure to fill in a rating for each item called for.

FORM Res 654

The University of the State of New York
The State Education Department
Child Development and Parent Education Bureau
Albany

Child's name _____

School _____

Rated by _____

Date _____

For each item, indicate rating by placing a check in the appropriate column.

X	1	2	3	4	5	
Child has not been exposed to a situation that would stimulate this	Child has never done this, to my knowledge	Child occasionally does this	Does and does not do this equally often	Does this more frequently than not	This is a characteristic response which almost always occurs	
						Frequent anger outbursts or temper tantrums
						Nervous habits (biting nails, sucking thumb, handling genitals, etc.)
						Prefers company of children younger than himself or company of adults
						Assumes role of "bully" with other children
						Depends upon whining, crying and tattling to get attention
						Displays unusual interest in own health, ailments and safety
						Remains physically inactive and offers no resistance to imposed authority
						Oversensitive to suggestion or criticism
						Prevented from facing reality by withdrawal into world of fantasy
						Seeks satisfaction by conduct that brings him into unpleasant relationship with other children and adults

raters are open to question and direct intercorrelation of the total scores assigned by the three raters in each school seems a satisfactory way of estimating the reliability of the data without attempting analysis of the causes of unreliability. These intercorrelations are presented in Table 1.

TABLE 1

RELIABILITY
Intercorrelations of total scores on rating scales assigned by the different raters

School	n	Coefficients
A	20	.73 .71 .94
B	25	.57 .74 .64
C	19	.23 .74 .45
D	25	.70*
E	26	.30 .43 .34
F	24	.36 .60 .60
G	23	.29 .47 .58

*There were only two raters in school D, consequently there is only one coefficient of intercorrelation possible.

These reliability coefficients are far from high, the median is .58, but if the scores of the three raters are combined by summation to give a single score, this score may be assumed to derive from a scale with a reliability of .81 (applying the Spearman-Brown- Prophecy Formula for estimation of reliability of a scale three times as long as one yielding a coefficient of .58). While one might well hesitate to apply this score as an objective description of a particular child, we may proceed with further analyses.

II

In this report our primary interest is the effect of nursery school training and this analysis is undertaken by a correlational procedure. Within each school, to minimize extraneous factors, the combined score assigned by the three raters (two in school D) is correlated against the number of months elapsing between the original registration of each child in the schools (which remain open twelve months the year) and the time at which the rating scale was filled out. Where used, chronological age is, of course, computed from date of birth. Table 2 presents the correlations between score on the scale (high score interpreted as greater insecurity) and length of time in the nursery school (col. 2),

TABLE 2

EFFECT OF TRAINING
Relation of score to age and experience in school
1. Score on rating scale. 2. Time in Nursery School.
3. Chronological age.

(col.1) School	(col.2) r 12	(col.3) r 13	(col.4) r 12.3	(col.5) range of time in N.S. (mo.)	(col.6) range of ages (mo.)
A	.07	-.10	.14	3 - 12	31 - 62
B	.16	.10	.24	4 - 6	30 - 54
C	.37	-.09	.44	2 - 12	35 - 58
D	.61	.07	.61	3 - 33	33 - 59
E	-.08	-.35	-.01	6 - 9	30 - 56
F	.32	.40	.01	3 - 30	31 - 60
G	.15	.11	.15	4 - 10	30 - 60

and chronological age (col. 3), and the partial correlation with time in the school partialing out age (col. 4). Both the age range of the children (col. 6) and the range of training time (col. 5) are also presented.

Column 4 of Table 2 proves an effective summary. In six of the seven schools the correlation between "insecurity" as measured by this rating scale, and length of time in the nursery school, partialing chronological age out, is positive. In the seventh school the negative coefficient is only .01. The coefficients are low, the median is +.15. The nature of these results, the positive correlation between insecurity score and time in the nursery school, requires either a more careful analysis of nursery school practice or a more careful analysis of the concept of insecurity represented by the rating scale used. The latter seems a reasonable first step.

In line with the focus of the interest in this paper, the analysis of the scale was undertaken by correlating the scores of the children on each item against length of time the child had been in nursery school, still separately for each school. The method of scoring each item is described above, and for this analysis the scores on each item assigned by the three raters were summated so that there was a theoretically possible range of 3-15 for each item. These correlations are presented in Table 3.

TABLE 3

ANALYSIS OF SCALE
Correlation between individual items of the scale
and length of time in the nursery school for each school separately

	ITEM									
	1	2	3	4	5	6	7	8	9	10
A	.04	.11	.39	.07	-.06	.00	-.37	-.02	-.34	.29
B	.06	-.09	.11	.02	.28	.36	-.08	.07	.22	.07
C	.41	-.26	.15	.09	.24	.52	-.18	.41	.02	.09
D	.44	.43	.27	.58	.02	.04	-.39	.34	.40	.46
E	-.10	-.06	.32	-.20	.04	-.05	-.23	-.20	-.02	.12
F	.13	.42	.15	.64	.44	.60	-.24	-.05	-.12	.18
G	.10	.13	-.11	.02	.02	.20	-.48	-.01	.23	.19

Inspection of Table 3 yields two points of interest-- there is considerable variation among the schools and considerable variation among the items. At present the latter variation is of major interest, though if nursery school practice were to be investigated, the former might prove invaluable as a point of departure. If the coefficients are classified as positive, negative or zero, we find two items indicating unanimity of effect in the schools, items number 7 and 10. The effect on these two items is in the opposite direction, the correlation coefficients being all negative on item 7 and all positive on number 10. That two items included within one scale should show such differences suggests that the composite may not represent a true unity, something besides insecurity may be involved.

A summary of Table 3 reveals the fact that the correlation is positive in 7 schools for item 10; in 6 schools for items 1, 3, 4 and 5; in 5 schools for item 6; in 4 schools for items 2 and 9; and in 3 schools for item 8. From this recapitulation it seems that scores on items 1, 3, 4, 5, 6 and 10 tend to be correlated positively with nursery school training whereas scores on 7 and perhaps 8 tend to be correlated negatively. Perhaps the difference between these groups of items may serve as a clue to the elements in the scale. Item 8 reads, "Oversensitive to suggestion or criticism;" item 7 reads, "Remains physically inactive and offers no resistance to imposed authority." The correlations suggest there is a tendency for children as a result of nursery school

experience to become less oversensitive to suggestion or criticism, and a marked tendency to become less inactive and to offer resistance to imposed authority. (The "double-barreled" nature of item 7 makes interpretation difficult. Were ratings made on the basis of physical activity or resistance to authority?)

It is the opinion of the present writers that the results of the analysis of item 7 of the rating scale furnish a clue to the fundamental questions involved in the questionnaire. Recent studies of the patterning of behavior in children of this age suggest that application of adult social and ethical classifications is an unsatisfactory way of analyzing the behavior. The behavior must be seen in the light of the child's organization of personality in order to be understood. A complete analysis of that organization is not yet available, but one fundamental axis about which the personality seems to be structured is that of the general activity involved. Whether a particular response requires a great or small degree of gross overt activity or social outgoingness is a more important consideration in predicting behavior at this level than whether it is socially desirable or undesirable. The obtained negative correlations between the school experiences and scores on items 7 and 8 of the scale provide confirmation of the correlary that the schools tend to decrease "inactive" behavior. The positive correlation between score on item 9 and the school training in four of the schools (negative in three) merits further consideration and analysis, which, unfortunately, due to lack of supplementary data can not be presented here. It may be that the complex wording of the question resulted in misinterpretation, but this suggestion can not be considered as either final or satisfactory. Perhaps item 3 warrants further consideration. The company of younger children may be construed as providing outlet for more activity than the company of children of an equal age or the company of adults. A more likely interpretation is that the correlation is an artifact. The longer children are in the nursery school, the older they become, and in consequence, the children who are in school longer will be forced by the relative age of their colleagues to be tending to play with children younger than themselves. (The correlations between chronological age and length of time in the nursery schools for the seven schools studied range from .04 to .79, all positive.) This tendency may then be construed by the raters as a "preference."

Items 4, 5 and 10 are probably functionally interrelated but as suggested by the preceding reference to the axis of activity-inactivity as are interpretation, the consideration of these manifestations (as well as item 1) without simultaneous study of other forms of activity on which an ethical approval might be placed is psychologically unsound. Elaborate discussion of the specifics here studied without the more adequate framework might easily lead to an incorrect emphasis in the evaluation of the schools.

That item 6, "Displays unusual interest in own health, ailments and safety" correlates positively with nursery school training in five of the seven schools is of especial interest. From the orientation of the scale, "unusual interest" may be construed as symptomatic of insecurity. To school administrators and teachers familiar with the usual interest displayed by young children in personal hygiene and health, an increase in interest is welcomed as an encouraging sign. The data here developed suggest that the schools are functioning to improve health habits and interests on the part of the children as well as to maintain and improve health standards. Merely to undertake the latter without the former would scarcely represent the functioning of an educational program. That health interests of the children are being stimulated by the nursery schools is a matter of signal importance in the understanding of the functioning of these institutions.

III

The discussion above has pointed out the difficulty of interpreting the total scores on the rating scale used. The reliability of the ratings by the teachers, as presented above, indicates that there is sufficient cohesion to the elements to make consideration of total score not impossible, though the further discussion indicates that interpretation of the total score is difficult. Let us, for a little while, consider the total score as an index of some unnamed aspect of the personality of the children. In enunciating a program of education which considers the wholesome development of personality as a primary objective, an attitude of disbelief is frequently encountered. "You can't change personality" is an implicit criticism in much of the opposition the public nursery school movement is meeting. The differences between curricula emphasizing "content" and "adjustment of the individual" are vast. That schools can develop "content" is demonstrated by the many standarized achievement tests available with grade norms. That schools can influence adjustment is not so readily susceptible of demonstration.

The rating scale used in this study is primarily concerned with adjustment and socialization of the individual rather than matters of specific training. Setting aside the question of the interpretation of the scores, the totals can be analyzed so as to give evidence in regard to the effectiveness of a program.

Since it is also possible to compute the correlation between score and chronological age, holding the effect of training constant, this has been done with the following results: For school A, the correlation is -.16; for school B, it is -.21; for school C, it is -.26; for D, -.13; for E, -.34; for F, +.25; and finally for school G, it is +.11. These findings clearly indicate that when we separate statistically the training and the age factor we find them working in opposite directions.

Training, in 6 of the 7 schools, correlates positively with score; chronological age, in 5 of the 7 schools, correlates negatively with score. Definite statement as to the relative importance of these two factors in the determination of development will vary, of course, as a function of the specific aspect of personality studied and the particular training program. These correlations are presented as evidence that systematic educational programs can be developed to affect personality and individual adjustment.

IV

In the light of the analyses and discussions presented above a number of conclusions emerge. The question of the nature and extent of the effect of nursery school training on the insecurity feelings of children can not be answered, even in part, by the present study.

Evidence has been developed which indicates that educational programs can be developed to influence personality and social adjustment as distinct from mere physical growth.

The analyses corroborate findings concerning the effect of the nursery schools on the activity of the children. Material was also available which indicated that nursery school training stimulates interest in personal health. Results of analyses of effects on several other items of the scale used await future research for adequate interpretation.

Considerable doubt is raised concerning the validity of the underlying theory of security-insecurity as developed in the rating scale used. To the extent that this application of theory is congruent with the general orientation of people interested in child development, further intensive study of insecurity at the early childhood level is needed.

THE DEVELOPMENT OF DIABETIC CHILDREN, WITH SPECIAL REFERENCE TO MENTAL AND PERSONALITY COMPARISONS[1]

GEORGE DAVENPORT BROWN, M.D.[2]

Murchison (17) in the preface to his Handbook of Child Psychology, expresses the opinion that insufficient work has been done on the problems of "nutrition and disease as factors in the development of child behavior" to warrant the inclusion in his book of a chapter discussing these factors. Diabetes mellitus is a good example of a physical disease which may be expected to have mental and personality manifestations.

White (21) remarks that "precocity of mental development (of the diabetic child) has persisted in spite of the delay in physical development." Joslin states that "one-third of our diabetic children were of superior intelligence," this statement being based on the results of giving the Stanford-Binet test to 169 children. Among Joslin's 6,300 patients, treated during more than thirty-five years, there have been 1,126 children (9). He states that data on many of them were incomplete or unavailable, and expresses the hope that his "admittedly incomplete discussion will stimulate research which will help to clarify those parts which are based on presumptive evidence."

The present study was undertaken to gather as complete data as possible on a representative group of diabetic children and to discover in what ways, if any, the diabetic child differs from the normal child in physique, intelligence and personality.

A brief description of diabetes may be in order at this point. Diabetes mellitus is a disorder of the normal functioning of the pancreas. Insulin, the internal secretion of that gland, is produced and absorbed into the blood in insufficient amount, so that the sugar and starches eaten are not efficiently utilized by the body. Indirectly, the metabolism of all foods is deranged in time, abnormal chemical products are formed, and sugar is wasted by being excreted in the urine. Insulin can now be obtained from the pancreas of animals, and when it is injected under the skin of diabetics in amounts and at times best suited to the individual it allows him to eat an essentially normal, well-balanced diet. When diabetics are once regulated as to food and insulin they should have no symptoms of the disease and should be able to live a normal life, except that their diet, exercise, sleep, and as much as possible their emotions should be uniform from day to day as to amount and length or intensity. Neither insulin nor any other substance yet known will cure diabetes; once insulin is necessary or advisable in any case, its use almost always has to be continued throughout life.

SUBJECTS AND CONTROLS

The plan for the present study was to make a comparison of the physical development, mental ability, and personality traits of the diabetic child before and after the onset of diabetes, and also to compare the diabetic child in these respects with a healthy sibling. Our original diabetic group consisted of sixty children, in all of whom the onset of diabetes occurred before fifteen years of age. All our subjects regularly attended the Diabetic Clinic of the Pediatric Department of the University of Minnesota Hospital or the Minneapolis General Hospital.[3] Included in this group were all the diabetic children who attended

[1] An article in press for the American Journal of Diseases of Children deals with the physical development of diabetic children.

[2] From the Institute of Child Welfare, University of Minnesota.

[3] The University Hospital takes cases almost solely from outside Minneapolis and St. Paul, while the General Hospital admits patients only from Minneapolis.

the University clinic between December 15, 1936 and April 29, 1937, totaling forty-two cases.

According to Joslin, about one out of every seven thousand children under fifteen years of age in the United States has diabetes mellitus. On that basis, the cases included in this study make up about two-thirds of the diabetic children in Minnesota. Table 1 shows the distribution of our cases in comparison with the total Minnesota population.

TABLE 1

NUMBER AND PERCENTAGE OF DIABETICS IN THIS STUDY COMPARED WITH NUMBER AND PERCENTAGE OF MINNESOTA POPULATION, IN EACH SOCIO-ECONOMIC GROUP

Socio-Economic Group*	Original Group of Diabetics		Revised Group of Diabetics	Minnesota Population
	Number	Per cent	(Per cent)	(Per cent)
I	1	1.7) 10.0	3.51) 10.53	2.38) 9.64
II	5	8.3)	7.02)	7.26)
III	9	15.0	15.79	12.77
IV	12	20.0	17.54	22.61
V.	14	23.3	24.56	21.37
VI	9	15.0) 31.7	15.79) 31.58	9.05) 33.61
VII	10	16.7)	15.79)	24.56)
All	60	57		

*According to Baker's (3) application of the Goodenough-Anderson Occupational Classification (6).

It may seem surprising that a group consisting solely of clinic patients should contain so representative a sampling. There are, however, a number of children from the upper three socio-economic groups admitted to the clinics, because of death of the father or for some similar reason. Both the University and the General Hospitals admit diabetic patients much more freely than patients suffering from diseases of shorter duration, because hospital authorities recognize the life-long nature of diabetes and the expense involved for insulin and special diet. Over one-half of our patients at the University Hospital paid for professional services and for their insulin at cost, while about one-third of the General Hospital cases paid varying small amounts.

Our group was probably somewhat more representative of the population of the area from which it was drawn than was that of Joslin, who does not definitely specify the socio-economic status of his child patients. Since, however, one-half of his patients are reported to have come from outside Greater Boston, where the George F. Baker clinic is located, and one-third from outside densely-populated Massachusetts, it seems altogether likely that few of them belong to the lowest socio-economic groups, for few families in these groups could very well afford the time and money necessary to take a child to the clinic from other states. It is reported (13) that 21.8 per cent of Joslin's entire group of patients are engaged in professional and semi-professional pursuits.

The urban-rural distribution of our patients approximated that reported by Adams (2) for the Mayo Clinic diabetic patients, but although our group contained a higher rural population than most other groups of diabetic patients that have been studied, it is still not sufficiently representative of the rural areas of the state, unless, as Joslin (10) suggests, diabetes is more prevalent in the city population.

In nationality, our group was typical of the Minnesota population. Of the forty-five cases for whom definite information was obtained, ten were "old American" of at least three generations, the parents of nineteen were Scandinavians; of ten, Germanic or semi-Germanic; of five, part or pure-blooded Anglo-

Saxons; and of eight, Slavic or semi-Slavic. Only four patients were Jewish or part Jewish.

By using a healthy sibling as control, rather than a child from the general population, we believed that a more exact comparison could be made as to the number and extent of the other variables. At the same time we realized that the sibling of a diabetic child is much more likely to contract the disease than is the average child. (According to Joslin (9) his chances of becoming a diabetic are thirteen times as great as those of the average child). We attempted, therefore, to diminish this possible error by choosing, whenever available, the next older rather than the next younger child to the patient as control in each family and to prove him non-diabetic. It was possible to obtain only twenty-eight such controls for individual study, but forty-eight for subjective comparison. The median chronological age of the sibling controls was fourteen years six months, the mean age thirteen years ten months. As to socio-economic status they were distributed as follows: Group I, none; Group II, 4; III, 5; IV, 3; V, 8; VI, 5; and VII, 3.

The median age for the entire group at the time of testing was thirteen years one month, the range being from twenty-two months to twenty years one month. Table 2 shows the age distribution of our original group of sixty cases.

TABLE 2

AGE AND SEX DISTRIBUTION OF DIABETIC CHILDREN IN OUR ORIGINAL GROUP

Age	Male	Female	Total
1 yr. 6 mos. to 2 yrs. 5 mos.		1	1
2 yrs. 6 mos. to 3 yrs. 5 mos.			
3 yrs. 6 mos. to 4 yrs. 5 mos.	1		1
4 yrs. 6 mos. to 5 yrs. 5 mos.		1	1
5 yrs. 6 mos. to 6 yrs. 5 mos.	2	1	3
6 yrs. 6 mos. to 7 yrs. 5 mos.	2	1	3
7 yrs. 6 mos. to 8 yrs. 5 mos.			
8 yrs. 6 mos. to 9 yrs. 5 mos.	1	1	2
9 yrs. 6 mos. to 10 yrs. 5 mos.	2	2	4
10 yrs. 6 mos. to 11 yrs. 5 mos.		4	4
11 yrs. 6 mos. to 12 yrs. 5 mos.	2	6	8
12 yrs. 6 mos. to 13 yrs. 5 mos.	3	2	5
13 yrs. 6 mos. to 14 yrs. 5 mos.	2	2	4
14 yrs. 6 mos. to 15 yrs. 5 mos.	3	6	9
15 yrs. 6 mos. to 16 yrs. 5 mos.	3	5	8
16 yrs. 6 mos. to 17 yrs. 5 mos.	2	2	4
17 yrs. 6 mos. to 18 yrs. 5 mos.			
18 yrs. 6 mos. to 19 yrs. 5 mos.		2	2
19 yrs. 6 mos. to 20 yrs. 5 mos.			
20 yrs. 6 mos. to 21 yrs. 5 mos.		1	1
Total	23	37	60

The median age for the onset of diabetes was eight years six months, and the mean duration of the disease previous to the time of this study was four years nine months.

Our group, as Table 2 indicates, consisted of thirty-seven girls and twenty-three boys, which is somewhat surprising, since Joslin reports virtually no sex differences in the incidence of diabetes among his child patients, though he tabulates small but definite differences in favor of the boys in all age groups. No definite recent sex trends have been reported for diabetic children. Although our group is too small for us to draw any definite conclusions in this respect, the decided preponderance of girls suggests that the increasing number of older fe-

male diabetics reported by Joslin (9), John (8), and Adams (2), is probably traceable in part to the onset of the disease in a large number of them during childhood, and is more likely to be associated with hereditary than with environmental factors.

The number of children per family in our group--median 3.8-- compared well with the average number of children per family in Minnesota, median 3.5, with the exception that there is among our cases a large percentage of families with six children and only three families with but one child. Three of our cases had a diabetic sibling, and in one family all three children were diabetics, which is a very rare occurrence. The youngest child in this family was the first to develop the disease, and three years later the eldest experienced the onset of diabetes on the day following the removal of tonsils. In our small group of children the percentage of incidence of diabetes among siblings is greater than among Joslin's subjects (9). We had one pair of dissimilar twins, only one of whom had diabetes. (This is in agreement with Joslin's findings (9). He reports that whereas in only two of sixteen pairs of dissimilar twins did both children have the disease, it was present in both children in nine of thirteen sets of similar twins).

PROCEDURE

The date and type of onset of diabetes, family history, developmental history and clinical and laboratory findings, including height and weight measurements, were obtained for each child from the hospital record and the parents. In addition each patient and control was given a physical examination, weighed and measured. All the patients were proved to have diabetes mellitus in various degrees of severity, and the controls to be free of diabetes and other definite disease. Parents were questioned verbally at the clinic and also by means of a questionnaire. In this questionnaire they were asked to compare the diabetic child in considerable detail with his sibling control. Both the children and their parents cooperated readily in all phases of the investigation. It must be borne in mind, however, that the parents' reports may not in all cases be completely reliable. Information on the diabetics and siblings was also obtained from the schools they attended. All the diabetic children with a mental age of over nine years were given the Intermediate or Advanced Otis Group Intelligence Tests and the Woodworth-Cady Psycho-Neurotic Inventory. All diabetics and siblings included in this study were given the revised Stanford-Binet individual scale for measuring intelligence. (Miss Barbara A. Mayer, psychometrist at the Institute of Child Welfare, gave most of the Stanford-Binet Intelligence tests and supervised the remainder). While the diabetic children were being given the mental tests, observations were recorded by the trained psychometrists so that it might be determined whether they exhibited any behavior that was definitely different from that of normal children in a similar situation.

FINDINGS

Ninety per cent of the questionnaires sent to the parents were returned completely or almost completely answered. They revealed that 43.3 per cent of the parents knew of no diabetics among their relatives, while 56.7 per cent had diabetic relatives. Table 3 shows this incidence of the disease, which is about the same as that reported by Joslin (9, 11). The mean number of relatives having diabetes among cases reporting any incidence in the family was two. Diabetic subjects having diabetic siblings or parent numbered six (10 per cent of the total group). The only other physical abnormality reported

for the families of our diabetic children to a greater extent than for the general population was some disturbance of the thyroid gland. This occurred in twenty-three of our cases.

TABLE 3

INCIDENCE OF DIABETES AND OTHER ENDOCRINE DISTURBANCES IN FAMILIES OF DIABETIC CHILDREN STUDIED

Relative	Cases of Diabetes	Cases of Other Endocrine Disturbances
Sibling	10	5
Parent	1	5
Parent's sibling	18	10
Grandparent	6	3
Grandparent's sibling	11	1
Other relative (including great-grandparent, cousin, etc.)	21	1
Total incidence in families	67	20

Physique and health.[4] Although it is generally realized that the diabetic child as well as the diabetic adult is more susceptible than the normal person to degenerative processes (probably less true under the present diabetic regime than under former ones), only 10 per cent of our diabetic children were shown to have complications or any other disease of more than three months duration.

Except for a few complications of diabetes, our children, according to the findings on physical examination, were of normal physique and health. Approximately half of them, according to parents' reports, had enjoyed as good health as their siblings before the onset of diabetes, and during the year immediately preceding our study only two were reported as having been in worse health. Eighteen cases reported some acute infection other than colds in the six months preceding the onset of diabetes, the most numerous being measles, tonsillitis, and scarlet fever. The parents of seventeen diabetics reported that these children had had more colds than their siblings during the past year, while fifteen reported fewer colds for the diabetics and eight, the same number.

Mental development and ability. It was found that our group of diabetic children was distributed quite normally as to intelligence, as may be seen from Table 4. This shows that 43 per cent of the diabetics are within the average I.Q. range (90 to 110) with approximately equal numbers above and below.

TABLE 4

DISTRIBUTION OF I.Q.'s FOR DIABETICS AND SIBLINGS

I.Q.	Diabetics				Siblings		
	M	F	Total	Per cent	M	F	Total
140 or over		1	1	1.7	2		2
130-140	1	2	3	5.0		1	1
120-130	4	1	5	8.3	2	1	3
110-120	3	5	8	13.3	3	2	5
90-110	11	15	26	43.3	9	5	14
80-90	3	7	10	16.7	1	0	1
70-80	1	4	5	8.3			
50-70		1	1	1.7	1	1	2
Number	23	37	60		18	10	28
Median	102.63	95.34	99.5				106.25
Mean	103.5	98.9	100.65				107.00

[4]This phase of the subject is more fully treated in my article "The Diabetic Child," in the American Journal of Diseases of Children.

Both the mean and the median I.Q. are almost exactly 100, as compared with a median I.Q. of 106 for the siblings. Joslin and White (9, 21) report in their special group of 169 diabetic children twice as many testing above 110 as below 90 on the "old" Stanford-Binet. The correlation coefficient of the I.Q.'s of our diabetic group with those of their siblings is 51 ± .091. In our group there is no deviation from the normal in the range of year levels nor in the pattern of abilities and disabilities. In fact, the group as a whole is developed regularly and evenly in mentality. No relationship was found between duration or severity of the disease on the one hand and intelligence on the other.

In discussing a paper on Juvenile Diabetes read in 1927, both Drs. F. S. Smyth and H. F. West made references to the diabetic child as "precocious" and "superior" (mentally). Just prior to the advent of insulin, Miles and Root (16) studied forty of Joslin's adult diabetics. Although they remark that many were of good education, they record a decrement of about 15 per cent or more in memory and attention tasks and a decrease in span and speed, but no increase in errors. A more recent study of juvenile diabetics in California by West et al (20) concludes that they are above average intelligence, although an adequate description of the group was not given.

Results were not materially altered when we removed from our calculations six diabetics who had complications or other diseases which, it was felt, might have interfered with their educational progress. This group consisted of three children with rather severe ocular defects, two children with hypothyroidism, one of whom also has epilepsy, and one with lipoidystrophy. Three new cases, including two private patients -- all uncomplicated and all belonging to the two upper socio-economic groups-- were substituted, and the mean and median intelligence quotients for the reconstituted groups were calculated. The mean I.Q. was 102.35, the median 100.5.

Parents reports of their opinions of the children's present ability and achievement indicated that the diabetics were doing approximately as well in their school work as their siblings were, also that they were doing as well at present as they did before the onset of the disease. Only one diabetic was considered by his parents to be less bright and less efficient than his sibling.

It may be of interest to realize that there was only one diabetic in Terman's group of gifted children, and he had contracted the disease after reaching the age of fifteen (18). The high percentage of bright children in Joslin and White's (9, 21) diabetic group may be due in part to the high percentage of Jewish children among their cases (Terman (19) and others have found more than the expected number of Jewish children in gifted groups), and in part to the weighting by those patients from the upper socio-economic groups.

Personality. Ratings on the Woodworth-Cady Psycho-Neurotic Inventory (Table 5) show an approximately equivalent distribution for the diabetics and

TABLE 5

DISTRIBUTION OF RATINGS ON WOODWORTH-CADY PSYCHO-NEUROTIC INVENTORY FOR DIABETICS AND SIBLINGS

Rating	Diabetics*		Siblings**	
	Number	Per cent	Number	Per cent
A	3	6.5	1	4.8
B	15	32.6	7	33.3
C	22	47.8	12	57.1
D	6	13.0	1	4.8
E	0	0	0	0
Total	46	100.0	21	100.0

*Median C.A., 14 years.
**Median C.A., 15 years 3 months.

their siblings. Neither group has a single case with an E rating (a decided deviation from the average in the direction of the neurotic), and few cases in either group come below the C, or normal, group. The fact that more diabetics than siblings have a rating of D may be due to the fact that some of the questions in the Inventory have to do with health, and this of course places the diabetics at a disadvantage.

Behavior of the diabetics as observed during the test situation showed little variation from the average. As many cases were found of extremely rapid mental functioning as of unusually slow mental functioning. There were a number of cases of physical sluggishness or stolid, phlegmatic temperament coupled with a normal or rapid rate of mental functioning. (These are typical Scandinavian traits). Carefulness, meticulousness, earnestness, and conscientiousness were noted an unusual number of times. This latter finding as well as the good school reports may, of course, be attributed to the habit-training forced on the diabetic child by the regimen of the disease.

All traits mentioned in the school reports were tabulated for both the diabetics and their siblings. While these traits do not lend themselves very well to quantitative treatment, it may be noted that desirable traits were listed for the diabetics half again as often as undesirable ones. Only twice was it reported that a diabetic child expected undue consideration on account of his disability, and only once that a child was sensitive about his condition. There was a surprising infrequency of mention of such traits as seeking attention and feeling inferior, which might well be expected to appear in a diabetic child.

Tables 6 and 7 summarize the parents' reports on the diabetic children's behavior. They indicate a prevailing opinion among the parents that the personality of the diabetics has been changed but little by the disease. Excitability and irritability are the only traits that show a considerable increase since the onset of diabetes, although there is some apparent increase in cautiousness and stubbornness. The former traits are also the only ones in which the diabetic child is considered by his parents to differ from his sibling to any appreciable extent. Virtually all the parents in the upper three socio-economic groups mention this increased excitability and irritability, so that it probably

TABLE 6

PARENTS' RELATIVE RANKING OF CERTAIN PERSONALITY TRAITS IN DIABETIC CHILDREN AT THE TIME OF THE STUDY AND PREVIOUS TO ONSET OF THE DISEASE

Personality Trait	Having Less of Trait		Having Same Amount		Having More	
	Number	Per cent	Number	Per cent	Number	Per cent
Activity, energy	8	22	19	51	10	27
Play	7	16	21	48	16	37
Work	10	23	20	47	13	30
Study	8	19	24	57	10	24
Persistence	7	16	22	51	14	33
Obedience	8	17	34	71	6	12
Stubbornness	6	13	21	47	18	40
Excitability	8	17	11	23	29	60
Irritability	4	8	14	29	31	63
Cheerfulness	6	12	33	69	9	19
Cautiousness	5	10	27	56	16	33
Earnestness, conscientiousness	5	11	26	54	14	31
Punctuality	8	17	25	54	13	28
Desire for attention	4	9	24	51	19	40
Being spoilt	9	21	25	58	9	21
Friendliness, sociability	3	6	27	58	17	36

is a real change and a more common one than the number reporting it would seem to indicate. This apparent increase in irritability may be caused in part by over-solicitiousness of the parents, in part by the child's fear of being considered inferior or different, and in part by the disadvantages or hardships forced on him by the disease. It is probably no more marked in diabetes than in other chronic diseases.

TABLE 7

COMPARISON OF CERTAIN PERSONALITY TRAITS IN THE DIABETIC CHILD AND HIS SIBLING CONTROL

Personality Trait	Much Less		Less		Same		More		Much More	
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
Activity, energy	1	4	4	16	14	56	3	12	3	12
Play	1	3	6	18	18	55	4	12	4	12
Work			3	9	14	42	13	39	3	9
Play			6	21	11	38	10	34	2	7
Persistence			3	9	20	59	7	21	4	12
Obedience			7	18	23	61	5	13	3	8
Stubbornness			10	20	18	47	7	9	3	9
Excitability			6	16	15	40	10	5	7	19
Irritability			8	21	12	32	13	34	5	13
Cheerfulness	1	3	2	5	25	66	8	21	2	5
Cautiousness			5	14	17	47	12	33	2	6
Earnestness			3	9	18	55	8	24	4	12
Punctuality			5	15	19	56	8	24	2	6
Desire for attention			7	19	22	61	7	19		
Being spoilt			5	15	21	64	4	12	3	9
Friendliness			4	11	22	63	6	17	3	9

It is important for the sake of the personality of the diabetic child that not too much attention or sympathy be bestowed on him by parents, teachers, or friends, in case he thus may come to feel different from other children and to expect privileges on account of his illness. He should be given the responsibility for his own welfare (testing his urine and giving his own insulin) as early as possible, and he should be made to feel that success depends upon himself in the matter of his total well-being.

SUMMARY AND CONCLUSIONS

Sixty diabetic children from two Minneapolis hospitals were studied to determine whether or not they differed significantly in physique, intelligence, or personality from non-diabetic children. Objective comparisons were made between twenty-eight diabetic children and an equal number of their siblings and subjective comparisons between forty-eight of the diabetics and their siblings. For the final determination of the mean intelligence quotient, the scores of six diabetics who had complications which might possibly have lowered their I.Q. were excluded, and three cases, selected in such a way as to make the socio-economic distribution of the whole diabetic group more representative, were added. These included two of the five private cases of diabetic children that could be found in Minneapolis.

From this study the following conclusions may be drawn:

1. The original group is typical of the diabetic clinic population of the two hospitals from which the cases were taken.

2. The modified group is representative of the children of Minnesota.

3. There is a wide distribution of cases in regard to location in the state, age of the children, and the duration and severity of the disease.

4. The group contains an unexplained preponderance of girls.

5. The group shows no deviation from the general average in intelligence and no significant deviation from the average for their own siblings or from the average for Minneapolis children.

6. School achievement and behavior of our diabetic group compared favorably with that of their siblings, in spite of poorer attendance. This may be explained in part perhaps by a transfer of the good habits inculcated in the diabetic by his doctor and his parents in regard to the physical care of the disease.

7. Increased irritability and excitability are the only significant personality changes noted by the parents and no significant deviations are noted in the school or testing situations.

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THE USE OF COMMANDS, SUGGESTIONS, AND REQUESTS BY NURSERY SCHOOL AND KINDERGARTEN TEACHERS

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In 1853, the Reverend James O. Andrew (1) wrote, "If you expect your children to succeed well in any of the walks of useful and honourable life, you must by all means seek to awaken within them a spirit of independence. Even from early childhood let them learn to wait on themselves." Also he advises parents to "take some pains and trouble in explaining matters" to children. "Let your commands be reasonable, and wisely adapted to age and time and circumstance."

The most up-to-date books on child psychology offer virtually identical advice. Blatz and Bott (2) say that few commands should be given, and that these should be voiced clearly and simply, with reasons whenever possible. Faegre and Anderson (6) agree with this view, and add the caution that commands and suggestions be given only when one is sure the child hears. Myers (14) states that we rarely need to command--requests are better. Thom (16) suggests that teachers give a few, well-thought-out commands and see that they are fulfilled. Foster and Headley (8) point out that a command implies that the one commanded must have his thinking done for him, whereas a suggestion implies that the one to whom it is made has the ability to think for himself.

As to positive commands as opposed to negative ones, it is a well-known fact that for years child psychologists have been adjuring parents and teachers not to say "don't" to children. Groves (10) declares that almost any negative command can be translated into a positive one, and Foster and Headley (8) say that if positive suggestions are made to children there will be little need for commands.

The tone of voice and enunciation used in addressing children is also considered important. Blatz, Millichamp, and Fletcher (3) say, "children should always be spoken to slowly and quietly and in matter-of-fact tones"; Rand, Sweeney, and Vincent (15), "enunciate slowly and clearly to be sure the child follows you"; and Gruenberg (11), "speak to children kindly and quietly, much as you would address a grown-up person."

The importance of following up commands or suggestions to see that the child actually carries them out is emphasized by Faegre and Anderson (6), Foster and Headley (7), Blatz and Bott (2), and Brill and Youtz (4), the consensus of opinion being summed up in the statement of the last-named writers that "a command that is not obeyed is worse than no command at all."

Presumably all these excerpts from the professional literature on child training are familiar to nursery school and kindergarten teachers. To what extent do they practice the doctrines they have been taught? This study was devised in order to determine the distribution of commands, suggestions, and requests used by trained teachers in a specific nursery school and kindergarten, and to study the effect of various factors on the use of commands, suggestions, and requests.

Review of the Literature. Studies of this type are comparatively new in the history of child psychology. One of the first was made by Deadman (5), who observed two teachers in the University of Chicago Nursery School, discussed with them their theories of adult-child relationships, and formulated a set of ten principles for giving directions to young children. In 1928 Vaughn (17) made a study of the effects of various kinds of instruction in controlling a

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child's behavior. He concluded that the most effective way of obtaining obedience from children was to accompany one's instructions by adequate reasons. Foster (7) in 1929 observed nursery school and kindergarten children and teachers and noted the various amounts of time given by the teachers to each of the children. Johnson (12) in 1935 investigated the influence upon children's behavior of different types of commands and suggestions. She concluded that positive, unhurrying, specific, and encouraging types of instruction are more effective than their opposites.

McClure (13) in 1930 made a very interesting study of the effect of varying verbal instructions on the motor responses of preschool children. She found that encouragement was more effective than discouragement, also that the order in which the command or suggestion was presented, the age of the child, and the desirability of the task all had an effect on the child's responses.

Subjects and Method. The present study was carried on in the nursery school and kindergarten of the Institute of Child Welfare, University of Minnesota. The subjects in the nursery school were 18 boys and 18 girls, ranging in chronological age from one year, eleven months to four years, nine months. Twelve were approximately two years old, twelve three years and twelve four years. Their I.Q.'s ranged from 89 to 135. In the kindergarten there were forty-two children, twenty-one of each sex, ranging in age from four years, eleven months to five years, ten months. Their I.Q.'s ranged from 75 to 140.

Observations of teacher-child relationships were made for a total of one hundred hours in the nursery school and for a total of twenty-nine hours in the kindergarten. Each of the full-time teachers in both the nursery school and the kindergarten was observed for the equivalent of four full days. The practice teachers were considered as a unit and were observed for the equivalent of four days.

A sample of the record blank used is given below:

Name of Child (Sonny) Name of Teacher (C) Place (103) Time 10:30-11:45 Date 4-7

Words spoken	Voice S O St E	Child's activity	Interest	Time Min. Sec.	Not done	Repeat	TH:
Sonny, we are going upstairs now	x	Pulling toy on floor	4	3	x	1	

The letters under "Voice" indicate whether the tone used by the teacher was subdued, ordinary, stern, or extraordinary. The figure under "Interest" indicates the degree of the child's interest in his occupation, as estimated on a five-point scale. "Time" is the amount of time that elapsed before the child responded. A check under "not done" means that the child did not obey the teacher's instructions, and the figure under "repeat" is the number of times she repeated her command or suggestion. TH is "teacher help."

The teachers were told that the children were being observed and timed for their responses to commands, etc., but they were not told that their own words and tone of voice were being recorded.

Words spoken by the teachers to the children were classified as:

1. Commands. "Sit up." "Give it to Dickie."

2. Commands with reasons. "Go get your sweater, Verne. We are going outside now." "Put one of those back, Patty, for you need only one."

3. Negative commands. "Don't throw sand."

4. Suggestions. "Let's leave your sandwich here." "Mary, you haven't used your wash cloth."

5. Requests. "Margaret, will you take this downstairs?"

A few commands and suggestions given by gesture during the rest period--such as a teacher's placing her finger on her lip when a child was whispering--were not recorded, since the number was very small.

Age and Sex Differences. Table 1 shows the number and percentage of the

various ways in which teachers gave instructions to children in each age group.

TABLE 1

NUMBER AND PERCENTAGE OF VARIOUS TYPES OF INSTRUCTION GIVEN CHILDREN IN EACH AGE GROUP

Age of Child	Commands		Commands With Reasons		Negative Commands		Suggestions		Requests		All
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number
2	295	55.3	67	12.5	2	.37	150	28.1	19	3.5	533
3	176	43.8	44	10.9	2	.49	150	37.4	29	7.2	401
4	230	41.4	53	9.5	3	.54	219	39.4	50	9.0	555
5	83	21.8	24	6.2	0	.00	203	53.2	71	18.6	381
Total	784		188		7		722		169		1870

In order to determine the significance of the difference in percentages, the standard deviation of the difference was obtained from Paterson and Edgerton's tables and the $\frac{\text{Diff.}}{\sigma \text{ diff.}}$ was calculated for each pair of age levels. These were as follows:

TABLE 2

$\frac{\text{DIFF.}}{\sigma \text{ diff.}}$ FOR VARIOUS INSTRUCTIONS GIVEN EACH AGE GROUP*

Ages	Commands	Commands with Reasons	Suggestions	Requests
2 and 3	3.46	.752	2.97	2.34
3 and 4	.735	.679	.627	.979
4 and 5	6.44	1.79	.368	4.02

*The percentage of negative commands was so small that the difference was not calculated.

Several interesting points may be observed in Table 1. For one thing, the percentage of commands given nursery school children decreased as the children grew older. There was a significant difference in the number given the two- and the three-year-olds, also in the number given the four- and the five-year-olds. The number of commands with reasons tended to decrease as the children grew older, but the difference was too slight to be significant. The number of suggestions increased consistently with the age of the child. Of all instructions given the two-year-olds, 28.1 per cent were suggestions; the three-year-olds, 37.4 per cent; the four-year-olds, 39.4 per cent, and the five-year-olds, 53.2 per cent, or more than half of all their instructions. The use of requests was also much greater at five years than at any preceding age. The percentage of requests at two years of age was only 3.5; at three, 7.2; at four, 9.0; and at five, 18.6. In view of child psychologists' general disapproval of negative commands it is also interesting to note that only seven were given during the one hundred hours observation in the nursery school and none during the twenty-nine hours observation in the kindergarten.

The sex differences in the various types of instruction given are shown in Table 3. It will be seen that in both the nursery school and the kindergarten the boys received slightly more commands than the girls. The differences are, however, slight and not significant. (This is similar to the finding of McClure.)

Figure 1 gives a graphic comparison of commands, suggestions, and requests for each age level and for boys and girls.

DISTRIBUTION OF COMMANDS, SUGGESTIONS AND REQUESTS

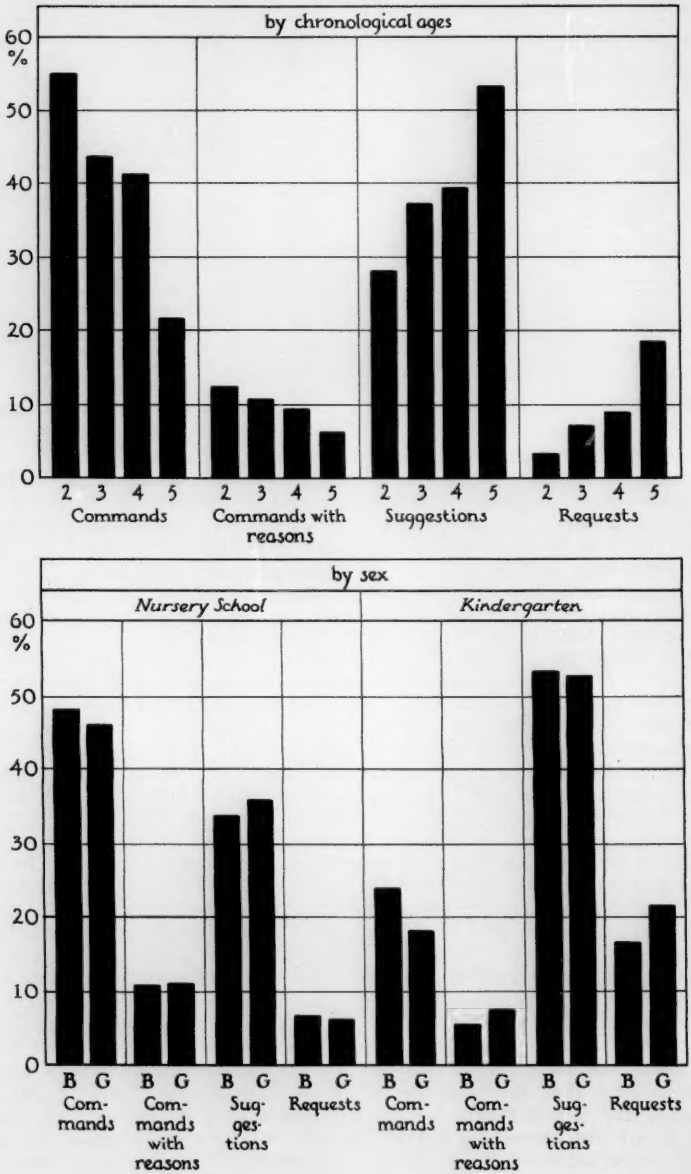

Figure 1

TABLE 3

NUMBER AND PERCENTAGE OF VARIOUS TYPES OF INSTRUCTION GIVEN BOYS AND GIRLS IN NURSERY SCHOOL AND IN KINDERGARTEN

Sex of Children	Commands		Commands With Reasons		Negative Commands		Suggestions		Requests		All
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number
Nursery School											
Boys	373	48.1	85	10.9	3	.38	262	33.7	53	6.8	776
Girls	328	46.0	79	11.1	4	.56	257	36.0	45	6.3	713
Diff.	.802		.117				.903		.371		
σ diff.											
Total	701		164				519		98		1489
Kindergarten											
Boys	56	24.0	13	5.5			125	53.2	39	16.7	233
Girls	27	18.2	11	7.4			78	52.7	32	21.5	148
Diff	1.36		.719				.095		1.16		
σ diff.											
Total	83		24				203		71		381

Relation to Intelligence. I.Q.'s used in this study were derived from Form B of the Minnesota Preschool Scale, which is given to all children entering the nursery school or kindergarten at the University of Minnesota. In the nursery school the 36 children were divided into three groups of 12 each, the first group having an I.Q. range of 86 to 104, the second from 105 to 119, and the third from 120 to 135. In the kindergarten likewise the children were divided into three groups of 14 each, the first group having an I.Q. range of 75 to 100, the second from 101 to 111, and the third from 112 to 140.

In regard to this aspect of the study, it was found that none of the teachers paid much attention to the difference in the children's I.Q.'s. When the teachers were asked to group the children under the proper I.Q. division, Miss B placed 25 per cent wrongly, Miss C 27.6 per cent, and Miss A 55.5 per cent. Although the teachers have access to the children's I.Q. records, it is obvious that they do not make much use of them. Certainly the teachers were not consciously making any distinctions in addressing commands, suggestions, or requests to children of various mental capacities.

It is not surprising, therefore, that the experimenter found little difference in the distribution of the various types of instruction given to children of different I.Q. level. There were slightly more commands and commands with reasons used in the lowest I.Q. groups than in others, in both nursery school and kindergarten, while the number of suggestions and requests increased with the higher I.Q. levels. In both nursery school and kindergarten the middle I.Q. group received the smallest percentage of commands, suggestions, and requests. This may be because the lowest group needed more urging to finish a task while the highest group needed more suggestions as to new things to do. As shown in Tables 4 and 5, the differences throughout are slight and not significant. A graphic representation of these findings is given in Figure 2.

Relation to Socio-economic Status. In the nursery school there were children from Groups I, II, III, V, and VI of the Goodenough-Anderson Scale for Occupational Classification (9). Their distribution is shown in Table 6, which also shows the results when Groups I and II and Groups V and VI were combined in order that the total number in each group might be more even. Tables 7 and 8 and Figure 3 show how commands, suggestions, and requests were distributed among the various groups. In the nursery school the number of commands increased in the lower socio-economic brackets, while the number of suggestions decreased. More requests were used in the nursery school with the higher socio-economic groups, but fewer in the corresponding kindergarten

DISTRIBUTION OF COMMANDS, SUGGESTIONS AND REQUESTS BY I. Q. GROUPS

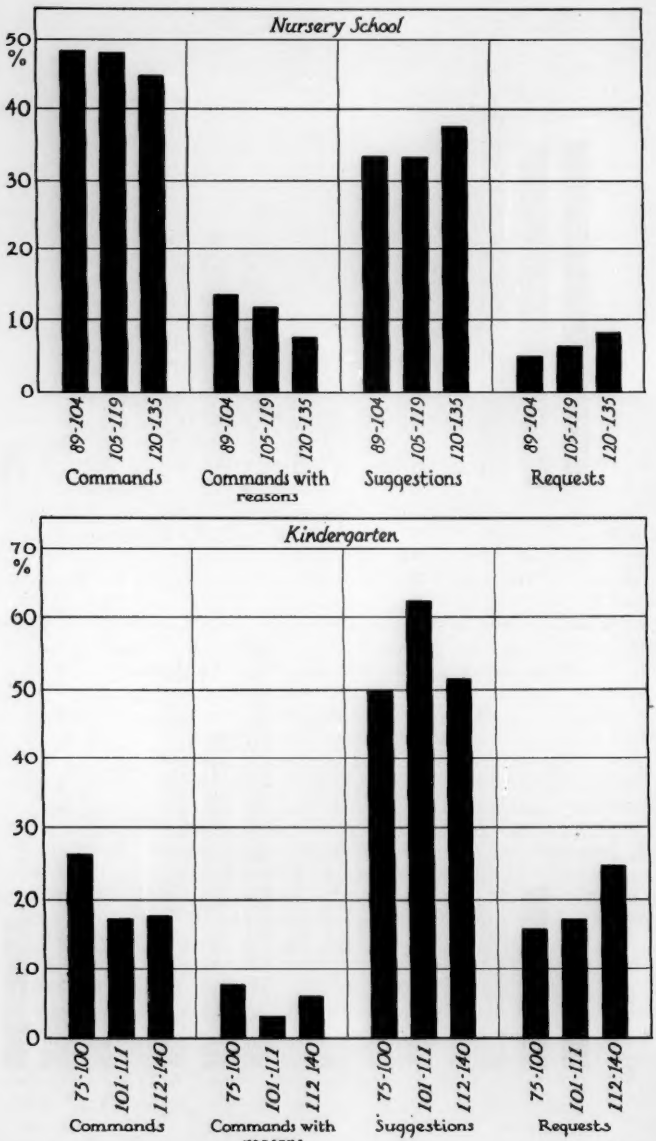

Figure 2

DISTRIBUTION OF COMMANDS, SUGGESTIONS AND REQUESTS FOR SOCIO-ECONOMIC GROUPS

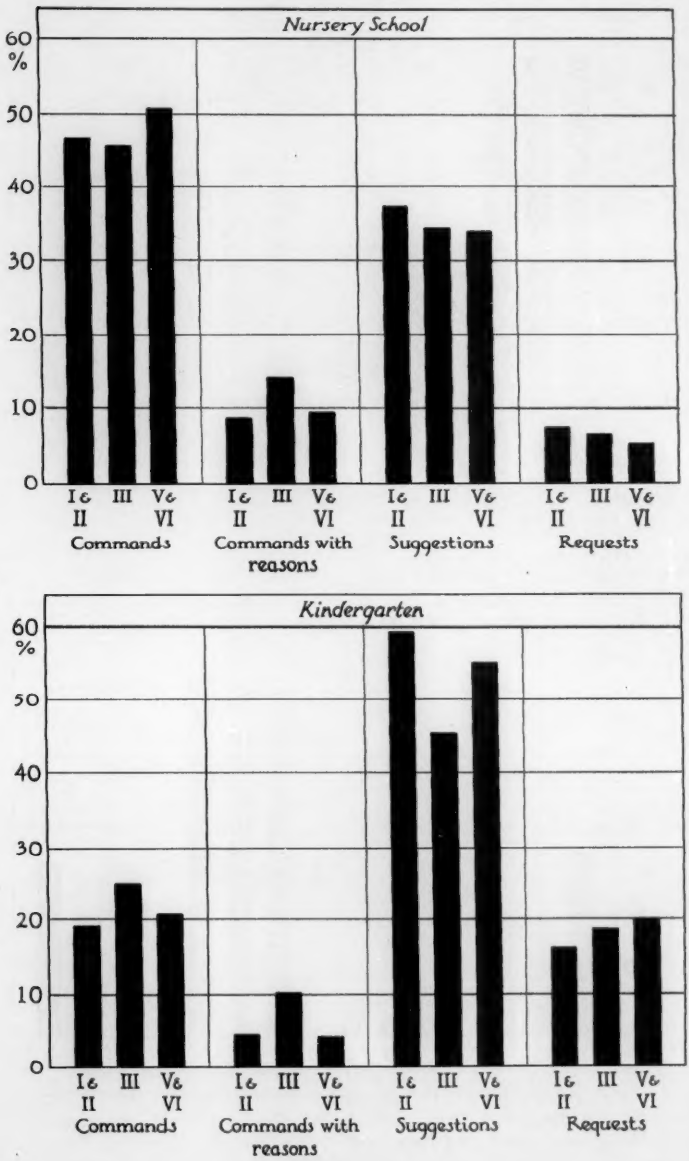

Figure 3

TABLE 4

NUMBER AND PERCENTAGE OF VARIOUS INSTRUCTIONS GIVEN DIFFERENT I.Q. GROUPS

I.Q.	Commands		Commands With Reasons		Negative Commands		Suggestions		Requests		All	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Nursery School												
89-104	244	48.2	69	13.6	1	.19	168	33.2	24	4.7	506	33.9
105-119	219	48.0	54	11.7	3	.65	151	33.1	29	6.3	456	30.6
120-135	238	45.1	41	7.7	3	.56	200	37.9	45	8.5	527	35.4
Total	701		164		7		519		98		1489	
Kindergarten												
75-100	48	26.6	14	7.7			90	50.0	28	15.5	180	47.2
101-111	15	17.0	3	3.4			55	62.5	15	17.0	88	23.0
112-140	20	17.6	7	6.1			58	51.3	28	24.7	113	29.7
Total	83		24				203		71		381	

TABLE 5

$\frac{\text{DIFF.}}{\sigma \text{ diff.}}$ FOR VARIOUS INSTRUCTIONS GIVEN DIFFERENT I.Q. GROUPS

I.Q. Groups	Commands	Commands With Reasons	Suggestions	Requests	All
Nursery School					
Low and middle	.60	.839	.032	1.02	1.085
Middle and high	.89	2.17	1.59	1.24	1.57
Low and high	.996	2.95	1.58	2.317	.505
Kindergarten					
Low and middle	1.83	1.51	1.94	.503	4.17
Middle and high	.109	.905	1.597	1.328	1.076
Low and high	1.815	.513	.215	1.853	3.08

TABLE 6

DISTRIBUTION OF SUBJECTS IN SOCIO-ECONOMIC GROUPS

Socio-Economic Group	Nursery School	Kindergarten	Combined Groups	Nursery School	Kindergarten
I	7	7	I and II	11	14
II	4	7			
III	12	14	III	12	14
V	9	10			
VI	4	4	V and VI	13	14

group. None of the differences is significant in either the nursery school or the kindergarten.

Relation to Time of Day. There is a significant difference in the number of commands, suggestions, and requests given in the nursery school at different hours of the day during the two free-play periods. More commands and commands with reasons were given during the afternoon period, whereas more suggestions and requests were given in the morning. Two factors may enter into the explanation of these findings; first, the fact that both teachers and children were fresher during the morning; second, the fact that in the afternoon

some of the children were drowsy after their naps, and consequently perhaps slower to respond.

TABLE 7

NUMBER AND PERCENTAGE OF VARIOUS TYPES OF INSTRUCTION GIVEN MEMBERS OF EACH SOCIO-ECONOMIC GROUP

Socio-Economic Group	Commands		Commands With Reasons		Negative Commands		Suggestions		Requests		All
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number
Nursery School											
I and II	233	46.6	44	8.8	6	1.2	177	37.4	39	7.8	499
III	212	45.5	72	14.4	1	0.2	169	34.7	33	6.7	487
V and VI	256	50.8	48	9.5			173	34.2	26	5.1	503
Kindergarten											
I and II	21	19.2	5	4.5			65	59.5	18	16.5	109
III	32	25.1	13	10.2			58	45.6	24	18.8	127
V and VI	30	20.7	6	4.1			80	55.1	29	20.0	145

TABLE 8

$\frac{\text{DIFF.}}{\sigma \text{ diff.}}$ FOR VARIOUS INSTRUCTIONS GIVEN DIFFERENT SOCIO-ECONOMIC GROUPS

Socio-Economic Group	Commands	Commands With Reasons	Suggestions	Requests
Nursery School				
High and middle	.338	2.717	.867	.621
Middle and low	1.629	2.304	.164	1.025
High and low	1.054	.366	1.052	1.646
Kindergarten				
High and middle	1.083	1.716	2.112	.458
Middle and low	.850	.125	.714	.717
High and low	.294	.014	.689	.577

By combining the two free-play periods, a three-hour period was obtained. This was compared with the three-hour period in the middle of the day (10.30 to 1.30), which is directed by the teacher. It was found that almost as many commands, suggestions, and requests were given during free play as during teacher-directed activities.

In the kindergarten there were two different groups of children, one meeting in the morning and the other in the afternoon. Since the two sessions are not of the same length, they cannot be compared. In Table 9, therefore, the morning and afternoon sessions of the kindergarten have been grouped together and the two free-play periods of the nursery school have been grouped together. Figure 4 shows the distribution of commands, suggestions, and requests used with the nursery school children (a) at different hours of the day and (b) during free-play periods as compared with teacher-directed play periods. (F= free play; D= teacher-directed play.)

Repetitions. The teachers observed in this study had evidently mastered the art of obtaining obedience from children without repeating instructions. Of the 1,489 commands, suggestions, and requests given in the nursery school there were only 80 repetitions, or 5.3 per cent. In the kindergarten there were only 5 repetitions out of a possible 381, or 1.5 per cent. The three-year-olds needed fewer repetitions than did the two- or the four-year-olds, while the five-year-olds needed the least number of repetitions. Boys in nursery school required 6.4

DISTRIBUTION OF COMMANDS, SUGGESTIONS AND REQUESTS AT DIFFERENT TIMES OF DAY

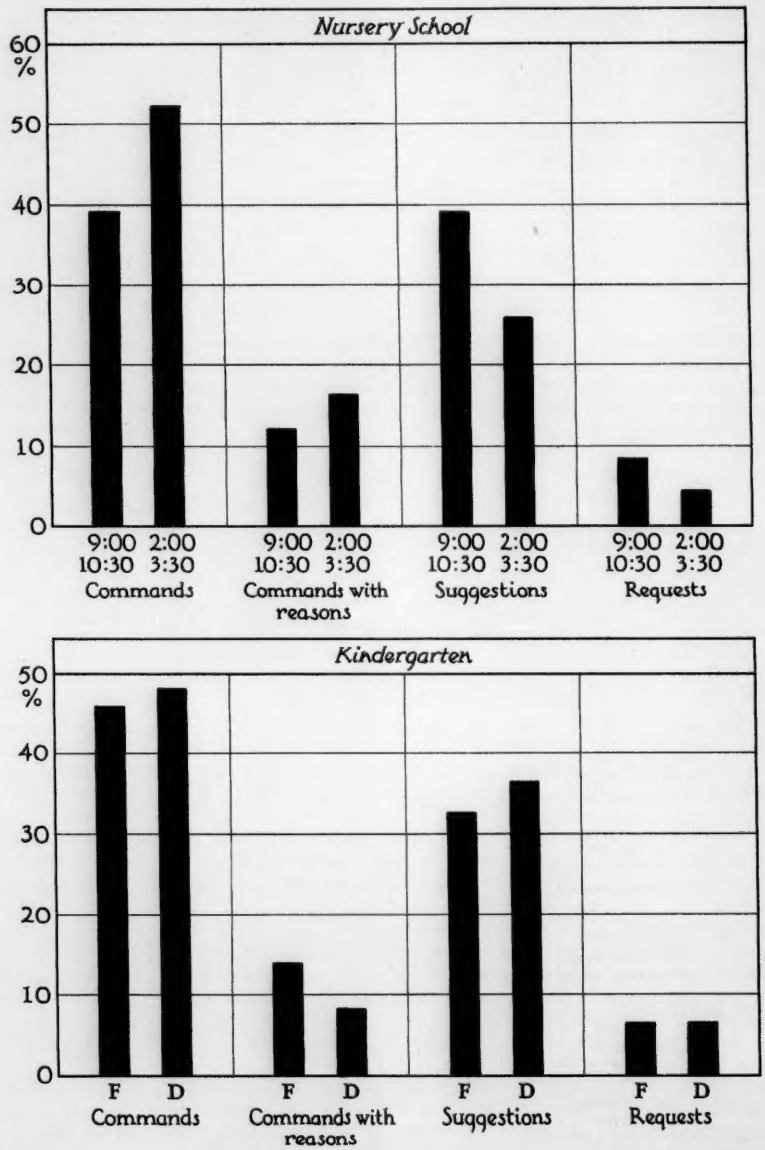

Figure 4

TABLE 9

NUMBER AND PERCENTAGE OF VARIOUS TYPES OF INSTRUCTION GIVEN AT DIFFERENT TIMES OF THE DAY

Time of Day	Commands		Commands With Reasons		Negative Commands		Suggestions		Requests		All
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number
Nursery School											
9-10:30	134	39.3	41	12.1	2	.5	134	39.3	29	8.5	340
2-3:30	175	52.3	55	16.4	2	.5	87	26.0	15	4.4	333
Diff.											
σ diff.	3.34		1.55				3.68		2.05		
Kindergarten											
10:30	309	45.8	96	14.2	4	.5	221	32.7	44	6.5	674
1:30	392	48.2	68	8.3	3	.3	298	36.5	54	6.6	815
Diff.											
σ diff.	2.37		3.43				1.49		.074		

per cent of their instructions to be repeated, girls only 4.2 per cent. In the kindergarten, on the other hand, girls required 2.6 per cent repeated, boys only .4 per cent. None of the differences is significant. It is a notable fact that even among the very young children in the nursery school only 5.3 per cent of all commands, suggestions, and requests needed to be repeated, and in the kindergarten only 1.5 per cent. The correlation between the number of instructions given each child per day and the number of repetitions required is .45 ± .0938.

Obedience. Equally striking is the record for obedience. Table 10 shows that only 5.9 per cent of all instructions given were not carried out. The two-

TABLE 10

NUMBER AND PERCENTAGE OF INSTRUCTIONS "NOT DONE" BY CHILDREN OF VARIOUS AGES IN NURSERY SCHOOL

	Age 2	Age 3	Age 4	All Ages
Commands				
Number given	295	176	230	701
Number not done	16	6	14	36
Percentage not done	5.4	3.4	6.1	5.1
Commands with reasons				
Number given	67	44	53	164
Number not done	4	2	6	12
Percentage not done	6.0	4.6	11.3	7.3
Suggestions				
Number given	150	150	219	519
Number not done	13	7	15	35
Percentage not done	8.7	4.7	6.9	6.7
Requests				
Number given	19	29	50	98
Number not done	0	0	6	6
Percentage not done	0.0	0.0	12.0	6.1
All instructions				
Number given	533	401	555	1489
Number not done	33	15	41	89
Percentage not done	6.1	3.7	7.3	5.9

and the four-year-olds both exceeded the three-year-olds in the percentage of instructions not complied with. This is in harmony with Foster's (7) finding that three-year-olds took less of the teacher's time than did children at the other two ages.

TABLE 11

NUMBER AND PERCENTAGE OF "TEACHER HELPS" GIVEN CHILDREN OF VARIOUS AGES IN NURSERY SCHOOL

	Age 2	Age 3	Age 4	All Ages
Commands				
Number given	295	176	230	701
Number teacher helps	50	21	17	88
Percentage teacher helps	16.9	11.9	7.3	12.5
Commands with reasons				
Number given	69	44	53	164
Number teacher helps	14	4	8	26
Percentage teacher helps	20.9	9.0	15.0	15.8
Suggestions				
Number given	150	150	219	519
Number teacher helps	33	25	25	83
Percentage teacher helps	22.0	16.6	11.4	15.9
Requests				
Number given	19	29	50	98
Number teacher helps	2	3	1	6
Percentage teacher helps	10.5	10.3	2.0	6.1
All instructions				
Number given	533	401	555	1489
Number teacher helps	99	53	51	203
Percentage teacher helps	18.5	13.2	9.1	13.6

TABLE 12

$\frac{\text{DIFF.}}{\sigma \text{diff.}}$ FOR TEACHER HELP GIVEN CHILDREN OF VARIOUS AGES IN NURSERY SCHOOL

Ages	Commands	Commands With Reasons	Suggestions	Requests	All
2 and 3	1.502	1.804	1.199		2.205
3 and 4	1.522	.920	1.368	1.396	1.916
2 and 4	3.453	.843	2.618		4.391

It was found that two-year-olds had to have suggestions repeated to a greater degree than did any other group and also that they left more suggestions undone than did the children of other ages. This may indicate that a two-year-old has not developed enough reasoning power to listen to a suggestion, think what to do, and then do it. The greatest number of instructions of all kinds left undone was found among the four-year-olds. This may have been due to the fact that the four-year-old child is interested in many things and hence his attention may wander from the carrying out of instructions in one activity to an entirely different matter. The comparatively large number of requests "not done" by the four-year-olds --12 per cent-- may be accounted for by the fact that teachers were following the suggestion of Myers in treating a request as a request: "If a child is asked, 'Would you like to shut the door?' and he says no, do not make him."

When the two sexes were compared in the matter of obedience, it was found that of the total number of commands, suggestions, and requests used in the nursery school, 5.9 per cent were left undone by boys and 6 per cent by girls. The difference is small and not significant. The rank order correlation between the number of instructions given and the number "not done" was .391 ± .098.

Teacher Help. There is a significant relation between the amount of "teacher help" given in the nursery school and the age of the child, the amount of help decreasing with age. An exception is found, however, in the case of commands with reasons, on which the four-year-olds received more help than the three-year-olds. It is worth while to note that of the 1,489 instructions of all types given in the nursery school, only 203 or 13.6 per cent were carried out with the help of the teacher; in other words, the children were helped very little and were encouraged to do things for themselves. There were no cases of teacher help in the kindergarten.

There was little difference in the amount of help given to boys and to girls, boys receiving help on 97 of 776 instructions, or 15.4 per cent, girls on 106 of 713 instructions, or 14.8 per cent. The differences are not significant. The rank order correlation between the number of instructions given per child per day and the number that had teacher help was .50 ± .086.

Tone of Teachers' Voices. The "extraordinary" voice was not noted at all during the observations. The ordinary speaking voice was used in giving 91.8 per cent of all instructions in the nursery school, the subdued voice in 6.4 per cent, and the stern voice in only 1.6 per cent. The ordinary voice was used during the entire period of observation in the kindergarten.

Comparison of Teachers. There was no significant difference in the percentage of commands, suggestions, and requests used by the four nursery school teachers. They all put the majority of their instructions to the children in the form either of commands or of suggestions, as Table 13 shows. Miss C, who was teaching for the first time, having been graduated only the previous year, gave a slightly larger percentage of commands than did any of the other teachers, and used more commands than any other type of instruction. Miss D, a practice teacher in her senior year at college, gave a larger percentage of suggestions than did any of the other teachers, also she gave more directions in the form of suggestions than in any other form.

TABLE 13

NUMBER AND PERCENTAGE OF VARIOUS INSTRUCTIONS GIVEN BY THE FOUR NURSERY SCHOOL AND TWO KINDERGARTEN TEACHERS

Teacher	Commands		Commands With Reasons		Negative Commands		Suggestions		Requests		All
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number
Nursery School											
Miss A	146	48.0	25	8.1	1	.3	107	34.9	26	8.4	305
Miss B	188	49.3	48	12.5	3	.7	113	29.3	29	7.6	381
Miss C	225	51.6	58	13.3	0	0	138	31.6	15	3.4	436
Miss D	142	38.6	33	8.9	3	.8	161	43.8	28	7.6	367
Total	701		164		7		519		98		1489
Kindergarten											
Miss E	58	36.0	13	8.0			56	34.7	34	21.1	161
Miss F	25	11.3	11	5.0			147	66.8	37	16.8	220
Total	83		24				203		71		381
Diff. / σ diff.	2.803						4.28		.459		

In the kindergarten Miss E, the assistant teacher, used almost the same percentage of suggestions as of commands, while Miss F, the full-time teacher, used six times as many suggestions as commands. A personality difference may be indicated by these differences which are shown graphically in Figure 5.

There was no significant difference among the teachers in the number of instructions they repeated. The number "not done" by the children decreased with the amount of teaching experience the teacher had had. With Miss D, the practice teacher, the children failed to respond to 34 instructions; with Miss C, the teacher with less than a year's experience, the number was 29; with Miss B, who was teaching for the second year, it was 15; and with Miss A, who had taught for several years, it was only 11. There were not enough cases, however, for these differences to be significant.

The varying amounts of teacher help given the children were not significant except for Miss B and Miss C. Miss B gave less help than the other three teachers, giving help in only 6.8 per cent of all possible situations. Miss C gave slightly more, helping the children in 16.9 per cent of the possible situations. Miss A helped in 14.7 per cent, and Miss D in 15.8 per cent. These slight variations may have been due to differences in personality, training, or experience.

Length of Time Taken to Respond. Foster and Headley (8) have pointed out that, while there is little difference in the length of time taken by children to respond to commands and to suggestions, a suggestion presents a problem to the child, whereas a command gives a solution. The children in this study took a median time of 6 seconds to respond to commands, 3.5 seconds for commands with reasons, 3.6 for suggestions, and 4.5 for requests.

As stated earlier, the interest of the child in his activity when addressed by the teacher was noted on a five-point scale, the higher ratings indicating the greater degrees of interest. Table 14 shows the mean length of time taken by the children to respond to instructions of all kinds, according to the degree of the child's interest in his activity at the time the instruction was given.

TABLE 14

MEAN NUMBER OF SECONDS ELAPSING BEFORE CHILDREN RESPONDED TO INSTRUCTIONS, ACCORDING TO DEGREE OF INTEREST IN ACTIVITY AND PERCENTAGE OF INSTRUCTIONS GIVEN AT EACH DEGREE OF INTEREST

Degree of interest	Percentage of Instructions at this Degree of Interest	Mean Number of Seconds before Child Responded
Nursery School		
1	39.3	5.7
2	38.8	6.2
3	11.0	15.7
4	6.4	20.6
5	4.2	21.0
Kindergarten		
1	7.4	2.16
2	26.3	2.9
3	25.7	4.1
4	17.8	3.3
5	23.7	5.4

It is readily apparent that the greater was the child's interest in his activity, the slower was his response to instructions. The interval before response was shorter in kindergarten than in nursery school children. The rank order correlation between the number of instructions given per child per day and the mean length of the interval before response was .34 $\pm$ .104.

DISTRIBUTION OF COMMANDS, SUGGESTIONS AND REQUESTS AS GIVEN BY TEACHERS

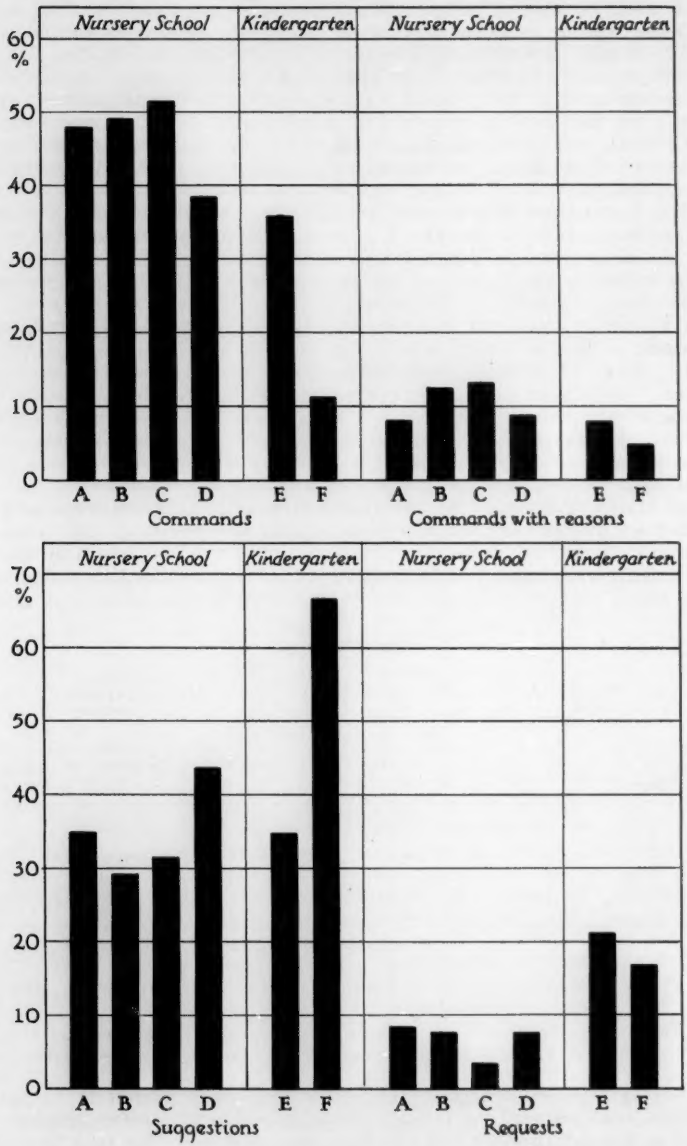

Figure 5

CONCLUSIONS

1. The number of commands and commands with reasons decreased with age, and the number of suggestions and requests increased. Few negative commands were given in the nursery school and none in the kindergarten.

2. There was little difference in the number of commands, suggestions, and requests given to boys and to girls respectively. More commands with reasons were used with the lower I.Q. groups, while more suggestions and requests were used with the higher I.Q. groups. This was apparently unintentional on the part of the teachers. There was no significant difference in the distribution of commands, suggestions, and requests among the different socio-economic groups.

3. The number of commands and commands with reasons was greater in the afternoon, while the number of suggestions and requests was greater in the morning. There was no significant difference between the number of instructions given during free play and the number given during teacher-directed play in the nursery school.

4. Only 5.3 per cent of all commands, suggestions, and requests given were repeated in the nursery school, and only 1.2 per cent in the kindergarten.

5. Only 5.9 per cent of all instructions given were left undone. The two- and the four-year-old children left more undone than did the three-year-olds. There was little sex difference.

6. The amount of teacher help given in carrying out instructions decreased with the age of the child. Only 13.6 per cent of all instructions were given teacher help.

7. The median length of time before a child responded to suggestions was shorter than the time for response to commands and requests. The mean length of time before the child responded to instructions varied directly with his interest in the activity in which he was engaged at the time of being addressed.

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STUDIES ON DENTAL CARIES
VI. CARIES EXPERIENCE AND VARIATION IN THE TIME OF ERUPTION OF THE PERMANENT TEETH[1]

HENRY KLEIN AND CARROLL E. PALMER

INTRODUCTION

Variability in the time of eruption of the permanent teeth is generally recognized as a normal characteristic of the growth and development of children.[2] Accordingly, any representative group of children may be expected to include some who may be characterized as "early eruptors", and others who may be characterized as "late eruptors". Such a group of children will include also some who are relatively susceptible and others who are relatively immune to dental caries. Systematic analyses of the constitution of the caries problem in children would appear to require, therefore, an inquiry as to whether or not any association exists between early or late eruption, per se, and attack of the teeth by the carious process.

Such an inquiry is pertinent for additional reasons. Thus it might be postulated that early eruption of the teeth implies a biological phenomenon analogous to the premature birth of children. With this postulate in mind, early eruption might be considered to contribute to a critical immaturity in the final stages of the development of the teeth. On the other hand, late eruption may be postulated as being consistent with full maturation in the development of the dental structures. The implications of these remarks take on special significance in the light of the suggestion that morphological maturation of the tooth surface might constitute a critical point in determining attack by, or resistance to, caries. While there is some evidence that gross hypoplasias of the teeth are not associated with increased liability to attack by caries, (1, 2, 3,) other evidence, chiefly adduced by Mellanby (4, 5,) would support the view that microscopic imperfections in crown development may be a factor in susceptibility to caries. It must be acknowledged that the Mellanby hypothesis is largely predicated on the assumption that such imperfections of the teeth are directly the result of dietary deficiencies. The perspective of the present discussion, it should be pointed out, would include the view that such imperfections may arise also because of other basic biological processes. A test of the validity of this hypothesis would appear to require an analysis of the relation of early and late eruption to the level of caries experience in appropriately selected groups of children.

Another reason for attempting to understand, in a quantitative sense, the possible relationship of the time of tooth eruption and caries experience, is predicated on observations included in a recently published paper (10) which indicate that significant familial relationships exist in the level of caries experience of children as well as in the time characteristics of tooth eruption. Since it is apparent that familial factors influence both caries experience and time of eruption of the teeth, the relation between these two latter variables, per se, becomes of some importance in analyses of the caries problem.

These considerations lead to the conclusion that in order to understand basic differences in the caries experience of different groups of children it is necessary to know whether or not differences in the time sequences of eruption of the teeth materially influence their caries experience.

[1] From Child Hygiene Investigations, Division of Public Health Methods, National Institute of Health, U. S. Public Health Service.

[2] In a recent publication (7) it has been shown that this variability, in respect to the age distribution of eruption, may be described by the normal probability function.

MATERIAL AND ANALYSIS

Preliminary Considerations. A direct approach to the problem presented in the introduction of this paper, would appear to require observations on the time of eruption of the teeth, together with clinical histories regarding the attack of these teeth by caries. The collection of such data implies a longitudinal or seriatim study and, since observations of this character are very difficult to obtain, it has seemed worth while to attempt to develop a method involving an indirect approach. The essential feature of this attempt to develop a methodology concerns a classification of children with respect to a characteristic which may be defined for present purposes as the "earliness" or "lateness" of the eruption of the permanent teeth. This classification is based on the hypothesis that the relative earliness or lateness of the time of eruption is highly correlated, at any specified chronological age,[3] with a count of the total number of erupted permanent teeth. For example, a child of eight years of age who has only six permanent teeth erupted may be classed as a late eruptor in comparison with another child of eight years who has 16 teeth erupted. Extension of this concept leads immediately to a recognition of the fact that an orderly arrangement of children of a given chronological age, according to the number of permanent teeth erupted into the mouth, also gives indirectly an orderly arrangement of the children with respect to the relative time of appearance of their teeth. Thus in a group of children of the same age, those with the fewest erupted teeth may be designated late eruptors; those with the greatest number of erupted teeth as early eruptors. In connection with this discussion, it is pertinent to point out that the assumption is made that children of the same age having the same total number of erupted teeth are considered identical with respect to the time of eruption of these teeth. As a corollary also it is obvious that this method of estimating relative dates of eruption is not applicable at young ages when most children have no erupted permanent teeth or at older ages when most children have nearly all of their teeth erupted.

A second important topic which requires discussion concerns the method of measuring quantitatively the attack of the teeth by caries. Thus it is necessary to recognize that an important difference between children whose teeth erupt early and children of the same age whose teeth erupt late is that the teeth of the former will have been exposed to the environment of the mouth, and therefore to the risk of attack by caries, longer than the teeth of the latter. Any attempt to determine whether or not early or late eruption, per se, is associated with difference in liability to attack by caries must take into account and control this factor of differential exposure. A method for determining the length of time the permanent teeth are exposed in the mouth, accumulated post-eruptive tooth age, has been described in a previous publication (8). By the application of the technique given in this reference, the caries experience of different groups of children can be expressed directly in terms of post-eruptive years of exposure of the teeth in the mouth.

A third important general point which requires consideration involves the fact that analysis must be made specific for the different morphological types of teeth. This requirement becomes obvious when it is indicated that relative susceptibility to attack by caries differs for the different types of teeth.[4] The measurement of total caries experience in a group of early eruptors as contrasted with a group of late eruptors would mean that comparisons were being made for heterogeneous populations of different kinds of teeth having different known levels[4] of relative susceptibility to attack by caries. In the light of this fact,

[3] See footnote 7.

[4] Details of a study on which these statements are based will be given in a subsequent communication.

the decision was made to limit the present investigation to a study of a single morphological type of tooth, the lower first permanent molar. This limitation of the study to data on the lower first molars is justified in part by the consideration that an association between the caries experience and the time of eruption of a single type of tooth may be taken as representative of the teeth in general. Furthermore, it is of some significance to indicate that the practical importance of this limitation of the study is somewhat lessened by the fact that approximately three-fourths of the caries experience of school children is found in the lower first molar (6).

This preliminary discussion of methodology may be summarized as follows: First, it is proposed to estimate quantitatively a characteristic defined as relative "earliness" and "lateness" of eruption of the permanent teeth from observations on the total number of erupted teeth. Second, a quantitative measurement of caries experience is to be expressed in terms of the length of time the teeth are exposed to the environment of the mouth, post-eruptive tooth age. Third, the present study is to be limited to an investigation of the association between the relative time of eruption of the lower first permanent molar teeth and the caries experience found in these teeth.

Material. Data suitable for the analysis of the relationship between time of eruption of the teeth and their attack by caries are afforded in records recently obtained in a dental survey of school children at Hagerstown, Maryland. Full details of the manner of collecting these data and the results obtained are to be found in previous publications (6, 7, 8, 9, 10,). In this place it may be stated that approximately 4,400 white children, comprising 94 per cent of the total enrollment of the municipal elementary schools, received in the spring of 1937 careful clinical dental examinations by dental officers in the employ of the United States Public Health Service. Records of these examinations contain observations on the number of permanent teeth erupted into the mouth and detailed descriptions of the location and specific surface involvment of the teeth by carious lesions. The examiners followed the arbitrary definition that a permanent tooth was erupted if the crown projected one millimeter or more above the margin of the gum. Carious lesions were those so designated on the basis of a careful clinical examination with mirror and sharp pointed pig-tail explorer. Pits and fissures in which the explorer caught were itemized separately and not designated as caries. For the permanent teeth caries experience was measured by means of a count of decayed, missing or filled (DMF)[5] teeth and tooth surfaces. In counting carious tooth surfaces, remaining roots and missing (extracted) permanent teeth were considered equal to five carious surfaces.

Analysis. The first step in the analysis made for the present study is indicated in the material presented in Tables 1, 2 and 3. Table 1 gives frequency distributions by age and sex groups of children classified according to the total number of permanent teeth erupted into the mouth. Table 2 gives the total number of erupted lower first permanent molars (both right and left) observed in the children classified as shown in Table 1. Following the same plan as used in the preparation of Table 2, Table 3 gives the number of the lower first permanent molars which have been attacked by caries (the number of DMF lower first permanent molars).

The next step in the analysis is concerned with subdividing into four categories the data for each age-sex group of children, each category representing a quartile subdivision of the frequency distribution of children arranged according to their number of erupted permanent teeth.[6] Categories entitled "first

[5]For a full discussion of the DMF concept, see reference 11.

[6]Methods of subdividing a frequency distribution into quartile groups are given in most elementary textbooks on statistics; see, for example, Yule, G. and Kendall, M. An Introduction to the Theory of Statistics, p. 147. (11th Edition, 1937) Charles Griffin and Co.

TABLE 1

NUMBER OF CHILDREN HAVING SPECIFIED TOTAL NUMBERS OF PERMANENT TEETH ERUPTED. DATA DERIVED FROM DENTAL EXAMINATIONS OF ELEMENTARY SCHOOL CHILDREN, HAGERSTOWN, MARYLAND.

Total number of permanent teeth erupted	AGE (Years last birthday)										All Ages
	6	7	8	9	10	11	12	13	14	15	
	BOYS										
0	22	5									27
1	8	3									11
2	24	4	2								30
3	14	5	1								20
4	29	8	-								37
5	13	7	1								21
6	31	43	4	1							79
7	7	18	10	1							36
8	8	17	21	5							51
9	2	12	10	4	1						29
10	8	39	58	19	2						126
11	2	12	25	13	7	1					60
12	3	21	52	78	42	7	2	1			206
13	-	1	29	34	30	11	3	-			108
14	-	1	12	29	21	6	7	1			77
15	-	1	2	29	34	15	4	1			86
16	-	-	3	15	21	17	5	1			62
17	-	-	-	5	18	18	6	1			48
18	-	-	-	10	16	18	9	1			54
19	-	-	-	4	16	9	13	3	1		46
20	-	-	1	2	14	27	13	1	-		58
21	-	-	-	-	6	13	8	6	3	1	37
22	-	-	-	2	13	28	24	5	3	-	75
23	-	-	-	2	9	18	26	3	2	-	60
24	-	-	-	-	11	21	20	21	7	2	82
25	-	-	-	-	3	8	26	17	10	3	67
26	-	-	-	-	3	18	40	40	26	9	136
27	-	-	-	-	2	11	19	40	40	13	125
28	-	-	-	-	1	16	74	125	107	60	383
Total	171	197	231	253	270	262	299	267	199	88	2237
	GIRLS										
0	11	3									14
1	6	2									8
2	15	3									18
3	13	1									14
4	15	5									20
5	8	6									14
6	38	26	6								70
7	7	12	1								20
8	17	25	14	-	1						57
9	6	20	8	-	-						34
10	15	51	46	4	4	1					121
11	1	15	25	3	2	-					46
12	2	28	89	60	21	3	1				204
13	1	4	30	36	16	3	2				92
14	-	2	15	24	12	7	1	1			62
15	-	2	10	31	24	6	1	-			74
16	-	-	6	15	23	6	4	1			55
17	-	-	2	13	14	7	2	-			38
18	-	-	2	19	23	12	7	2			65
19	-	-	-	11	16	15	4	1			47
20	-	-	1	8	22	11	15	3			60
21	-	-	1	4	12	18	8	2	1		46
22	-	-	-	3	12	26	16	6	-		63
23	-	-	-	6	13	12	18	5	2		50
24	-	-	-	2	18	35	17	14	3	1	90
25	-	-	-	1	7	30	18	16	6	2	80
26	-	-	-	-	8	23	47	32	9	6	125
27	-	-	-	-	2	15	29	39	22	8	115
28	-	-	-	-	9	39	113	156	122	41	480
Total	155	205	256	240	259	269	297	278	165	58	2182

TABLE 2

NUMBER OF LOWER FIRST PERMANENT MOLARS ERUPTED IN THE MOUTHS OF CHILDREN HAVING SPECIFIED TOTAL NUMBERS OF PERMANENT TEETH ERUPTED. DATA DERIVED FROM DENTAL EXAMINATIONS OF ELEMENTARY SCHOOL CHILDREN, HAGERSTOWN, MARYLAND

Total number of permanent teeth erupted	AGE (Years last birthday)										
	6	7	8	9	10	11	12	13	14	15	All Ages
BOYS											
0	-										
1	6										6
2	20	-	2								22
3	17	6	1								24
4	40	15	-								55
5	21	11	-								32
6	60	86	8	2							156
7	14	36	20	2							72
8	16	34	42	10							102
9	4	24	20	8	2						58
10	16	78	116	38	4						252
11	4	24	50	26	14	2					120
12	6	42	104	156	84	14	4	2			412
13	-	2	58	68	60	22	6	-			216
14	-	2	24	58	42	12	14	2			154
15	-	2	4	58	68	30	8	2			172
16	-	-	6	30	42	34	10	2			124
17	-	-	-	10	36	36	12	2			96
18	-	-	-	20	32	36	18	2			108
19	1	-	-	8	32	17	26	6	2		91
20	-	-	2	4	28	54	26	2	-		116
21	-	-	-	-	12	26	16	12	6	2	74
22	-	-	-	4	26	56	48	10	6	-	150
23	-	-	-	4	18	36	52	6	4	-	120
24	-	-	-	-	22	41	40	42	14	4	163
25	-	-	-	-	6	16	52	33	20	6	133
26	-	-	-	-	6	36	80	80	51	18	271
27	-	-	-	-	4	22	37	80	79	26	248
28	-	-	-	-	2	32	148	250	214	120	766
Total	224	362	457	506	540	522	597	533	396	176	4313
GIRLS											
0											
1	2										2
2	10	2									12
3	16	1									17
4	26	5									31
5	14	11									25
6	76	50	12								138
7	14	22	2								38
8	34	50	28	-	2						114
9	11	40	14	-	-						65
10	30	101	92	8	8	2					241
11	2	30	50	6	4	-					92
12	4	56	178	120	42	6	2				408
13	2	8	60	72	32	6	4				184
14	-	4	30	48	24	14	2	2			124
15	-	4	20	62	48	12	2	-			148
16	-	-	12	30	46	12	8	2			110
17	-	-	4	26	28	14	4	-			76
18	-	-	4	38	46	24	14	4			130
19	-	-	-	22	32	30	8	2			94
20	-	-	2	16	44	22	30	6			120
21	-	-	2	8	24	36	16	4	2		92
22	-	-	-	6	24	51	32	12	-		125
23	-	-	-	12	26	23	24	10	4		99
24	-	-	-	4	36	70	34	28	6	2	180
25	-	-	-	2	14	60	36	32	12	4	160
26	-	-	-	-	16	46	94	64	18	12	250
27	-	-	-	-	4	30	58	78	44	16	230
28	-	-	-	-	18	78	226	312	244	82	960
Total	241	364	510	480	518	536	594	556	330	116	4265

TABLE 3

NUMBER OF LOWER FIRST PERMANENT MOLARS DECAYED, MISSING OR FILLED (DMF) IN THE MOUTHS OF CHILDREN HAVING SPECIFIED TOTAL NUMBERS OF PERMANENT TEETH ERUPTED. DATA DERIVED FROM DENTAL EXAMINATIONS OF ELEMENTARY SCHOOL CHILDREN, HAGERSTOWN, MARYLAND

Total number of permanent teeth erupted	AGE (Years last birthday)										All Ages
	6	7	8	9	10	11	12	13	14	15	
BOYS											
0											
1	2										2
2	-										-
3	1										1
4	2										2
5	-										-
6	6	15	3								24
7	2	3	4								9
8	6	5	6	1							18
9	-	9	3	4							16
10	4	20	26	18							68
11	4	4	17	6	6						37
12	-	16	39	58	37	8					158
13	-	-	28	41	28	14	4				115
14	-	2	14	31	28	5	7				87
15	-	2	4	33	37	11	2				89
16	-	-	4	20	25	21	8	2			80
17	-	-	-	6	25	24	9	1			65
18	-	-	-	15	23	20	9	-			67
19	-	-	-	3	19	7	15	4	1		49
20	-	-	2	2	14	39	21	-	-		78
21	-	-	-	-	10	14	8	9	4	2	47
22	-	-	-	4	20	37	32	7	3	-	103
23	-	-	-	4	12	28	43	2	4	-	93
24	-	-	-	-	18	27	29	32	11	4	121
25	-	-	-	-	4	12	26	25	19	5	91
26	-	-	-	-	4	31	53	59	36	17	200
27	-	-	-	-	-	11	31	62	66	26	196
28	-	-	-	-	1	21	109	159	153	105	548
Total	27	76	150	246	311	330	406	368	297	159	2364
GIRLS											
0											
1	1										1
2	1	1									2
3	1	-									1
4	2	-									2
5	-	-									-
6	9	9	3								21
7	3	8	1								12
8	8	12	5	-	2						27
9	-	14	5	-	-						19
10	12	43	26	3	5						89
11	-	8	22	2	1						33
12	-	19	62	43	22						146
13	-	4	35	42	21	3	3				108
14	-	4	17	25	14	4	1	1			66
15	-	3	15	37	29	6	2	-			92
16	-	-	6	17	15	8	4	2			52
17	-	-	2	23	20	13	2	-			60
18	-	-	3	32	33	18	7	3			96
19	-	-	-	16	23	14	4	2			59
20	-	-	-	13	31	12	19	5			80
21	-	-	2	7	20	25	13	3	1		71
22	-	-	-	1	18	36	25	9	-		89
23	-	-	-	9	20	19	19	6	4		77
24	-	-	-	2	25	45	19	26	3	2	122
25	-	-	-	2	10	34	23	21	10	4	104
26	-	-	-	-	12	29	69	53	18	11	192
27	-	-	-	-	4	23	46	68	39	14	194
28	-	-	-	-	16	53	154	257	201	69	750
Total	37	125	204	274	341	342	410	456	276	100	2565

quartile" contain, therefore, data for that 25 per cent of the children in each age-sex group who have the fewest number of erupted teeth; the "second quartile" contains data for the next 25 per cent of the children who have the next fewest number of erupted teeth; the "third quartile" contains data for the next 25 per cent; the "fourth quartile" contains data for the remaining children, or those who have the highest number of erupted permanent teeth. This method of classification of the children according to number of erupted permanent teeth provides, on the basis of the hypotheses discussed in a previous section of this paper, four groups of children that are assumed to be differentiated with respect to the earliness or lateness of the time of eruption of their permanent teeth. Thus the first quartile contains the children who may be considered to be the "latest" eruptors; the fourth quartile, children who may be classed as the "earliest" eruptors; the second and third quartiles represent children intermediate between these two extremes in the time of eruption of their teeth.

The arrangement of the data given in Tables 2 and 3, according to quartile subdivisions of the distributions given in Table 1, provides material for tabulations of the number of erupted lower first molars and the number of these teeth attacked by caries for children in each quartile group.

TABLE 4

PER CENT OF ERUPTED FIRST LOWER MOLARS THAT HAVE BEEN ATTACKED BY CARIES (DMF), BY QUARTILES OF DISTRIBUTION OF CHILDREN ARRANGED ACCORDING TO TOTAL NUMBER OF PERMANENT TEETH ERUPTED. DATA DERIVED FROM DENTAL EXAMINATIONS OF ELEMENTARY SCHOOL CHILDREN, HAGERSTOWN, MARYLAND

	AGE (Years Last Birthday)									
Quartile:	6	7	8	9	10	11	12	13	14	15
BOYS										
First	12.0	9.0	18.0	34.8	42.6	53.7	59.8	67.2	76.0	95.5
Second	4.4	14.0	24.1	39.2	56.6	62.2	71.6	75.5	81.1	90.9
Third	6.0	26.0	36.5	56.8	64.9	67.2	66.9	65.3	71.5	87.5
Fourth	21.8	31.3	52.0	63.6	66.3	69.8	73.8	63.6	*	*
GIRLS										
First	12.4	17.3	26.8	35.8	58.4	55.0	67.6	78.2	87.2	91.8
Second	7.1	29.8	37.3	53.9	55.1	70.8	67.4	85.2	82.7	84.7
Third	14.6	42.4	35.9	61.4	73.7	60.7	73.0	82.4	82.4	84.2
Fourth	24.1	37.6	59.8	77.2	76.2	68.9	68.1	*	*	*

* Separate quartile values not obtainable because 50 percent or more of the children have the full complement of 28 permanent teeth erupted.

From these tabulations the percentages of lower first molars that are decayed, missing or filled (DMF) are calculated. These are shown in Table 4. Inspection of this table makes evident the fact that marked and consistent respective differences exist in the caries experience of children of the several quartile subdivisions. For example, at eight years of age, boys who may be designated as the earliest eruptors (those in the fourth quartile at this age)

have 31.3 per cent of their lower first molars attacked by caries, while boys at the same age who may be designated as the latest eruptors (those in the first quartile) have only 9 per cent of their lower first molars DMF. Caries attack rates intermediate between these are found for boys in the second and third quartile. Except for children in the older age groups, where the method of differentiation based on the number of erupted teeth does not allow a precise separation of the quartile groups,[7] the differences between the various quartile categories clearly show that the earlier the teeth erupt the higher is the percentage of lower first molars attacked by caries. In order to illustrate these differences, Figure 1 shows graphically the relation between the caries attack rates and chronological age for the boys in the first and fourth quartile groups. In general, in both sexes, it is apparent that the earliest eruptors show very much higher caries attack rates than do the latest eruptors for that period during which it is possible to distinguish, with reasonable precision by the method adopted, between the early and late eruptors.

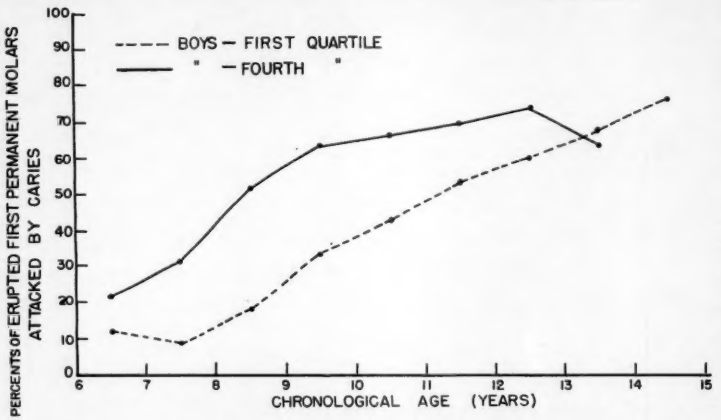

Fig. 1. The relationship between chronological age and the per cent of the lower first permanent molars that are attacked by caries (DMF). For boys who are designated "earliest" and "latest" eruptors. See text for a description of the latter terms.

In the preliminary discussion of methodology applicable to the problem under consideration in this paper, it was pointed out that the length of time the teeth are exposed to the environment of the mouth bears a very significant relation to attack of the teeth by caries. Moreover, it was noted that at the same chronological age the teeth of relatively early eruptors will be exposed in the mouth longer than will the teeth of late eruptors. The immediate consequence of these two factors naturally may be postulated to find expression in a higher caries rate for early as contrasted with late eruptors and, indeed, this is the result observed in Table 4 and Figure 1. In order to determine whether or not early or late eruption, per se, is related to caries experience it becomes necessary, as has been pointed out, to control or equalize the factor

[7]As pointed out earlier in this paper, the determination of relative time of eruption of the teeth from counts of total number of erupted teeth cannot be determined by this method when the total count of teeth approaches the complement of 28 teeth. In boys this point is reached for the third and fourth quartiles in the 13-year old group and in girls it is reached for these quartiles in the 12-year old group.

of mouth exposure. Exploration of this subject leads directly to the practical application of a technique for estimating post-eruptive tooth age which has been described in a previous paper (8). Use of this technique in the special problem under discussion here requires a slight elaboration of the original concept of post-eruptive tooth age.

It has been shown that the age distribution of eruption of a single morphological type of tooth, say the lower first permanent molar in boys, may be described mathematically by the normal probability (Gaussian) curve (7). In addition, it has been shown that the integral of this curve furnishes a very useful mathematical description of the eruption of a particular tooth into the mouths of a group of children. Figure 2 shows graphically this relationship between chronological age and the appearance of the lower first permanent molar[8] in boys. On this graph, the S-shaped curve[9] describes the increase with age in the per cent of boys who have the lower first molar erupted into

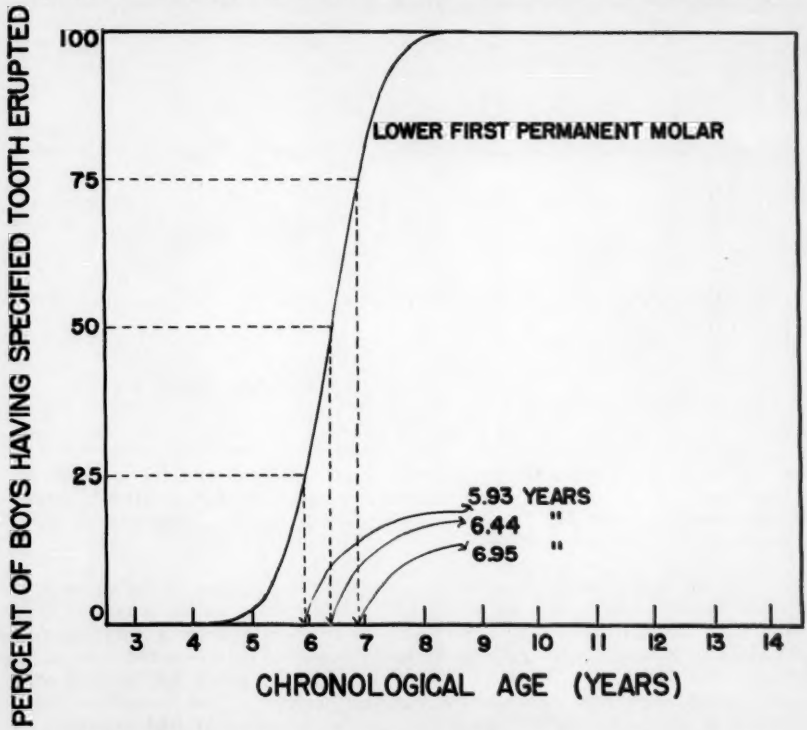

Fig. 2. The relationship between chronological age and the per cent of boys having the lower first permanent molar tooth erupted into the mouth.

the mouth. Thus the graph illustrates the fact that in 25 per cent of the boys this tooth has appeared by the age of 5.93 years, in 50 per cent it has

[8]Since it has been shown (7) that no statistically significant differences exist in the time of eruption of corresponding teeth on the right and left side of the same jaw, a single curve may be used to describe the age distribution of eruption of either tooth.

[9]The mean and standard deviation of the normal curve which describes the age distribution of eruption of the lower first permanent molar in boys are, respectively, 6.44 years and 0.75 years. Analogous figures for this tooth in girls are 6.12 and 0.67 years. (See reference 7)

appeared by the age of 6.44 years, and in 75 per cent by the age of 6.95 years.

Since the ordinal scale for the graph given in Figure 2, although entitled per cent of children having the tooth erupted, also represents number of teeth, and since the abscissal scale, although entitled chronological age, also represents age in years, it may be noted that the product of these two axes, or the area in the coordinate system, represents tooth years. From the biological or epidemiological standpoint, tooth years furnish a precise measure of years of exposure of the teeth in the mouth. Through the application of the technique of the integral calculus it becomes clear that the area under the S-shaped curve up to any specified chronological age, or the double integral of the normal curve from minus infinity ($-\infty$) to the specified age, represents this measure of the number of tooth years of mouth exposure of the lower first molar tooth. Furthermore, the subdivision of the area under the S-shaped curve into parts, as illustrated in Figure 3, furnishes a simple method for obtaining tooth years of exposure of the teeth for quartile groups, or for any other desired subdivision,

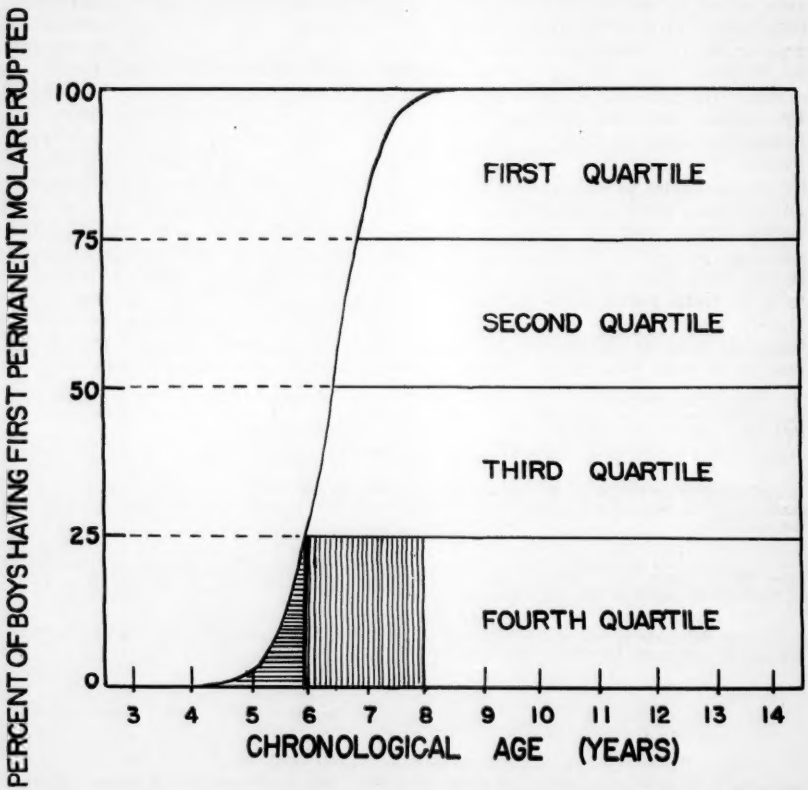

Fig. 3. Diagramatic illustration of the method of calculating post-eruptive tooth years of exposure in the mouth of the lower first permanent molar tooth of boys. See text for description.

of the distribution of children according to the time of eruption of the particular tooth. An example of the actual calculation of the tooth years of exposure of a particular tooth in the mouths of a special group of boys may facilitate the description of this methodology.

Suppose it is desired to determine the tooth years of exposure of the lower right first permanent molar in a group of exactly 8-year old boys who represent that 25 per cent of the total group of boys who first have this tooth erupt into the mouth (designated fourth quartile group in Figure 3). In terms of the integral calculus, and as illustrated in Figure 3, the tooth years of exposure for this special group of boys is represented by the shaded area under the S-shaped curve which is bounded as follows: a) the horizontal abscissal line in the figure; b) a vertical line through the point on the abscissa which marks a chronological age of eight years; c) a horizontal line through the point of the ordinate which is marked 25 per cent, and d) the portion of the S-shaped curve which lies between the intersection of this curve with the two horizontal boundary lines. The actual determination of the area so marked out may be acccomplished in two steps; first, the measurement of the irregularly shaped area which is shaded with horizontal lines and, second, the measurement of the rectangular area which is shaded by vertical lines. The horizontally shaded area under the curve may be represented by the double integral of the normal curve from $-\infty$ to the point on the scale of chronological age where 25 per cent of the boys have the tooth erupted. Since the mean and standard deviation of the normal curve representing the age distribution of eruption of the lower first permanent molar in boys has been shown (7) to equal 6.44 and 0.75 years, respectively, the latter point may be shown readily to equal 5.93 years.[10] From the tables of the double integral of the normal curve given in reference (8), it may be determined that this portion of the total area, or time of exposure of the teeth up to age 5.93 years equals 0.45 tooth years.[11] The rectangular portion of the area (shaded with vertical lines) representing exposure of the teeth from 5.93 years to 8.0 years, is equivalent by simple subtraction to 2.07 tooth years. The sum of the two subdivisions of the total area obviously equals 2.52 years. This last figure, 2.52 years, represents the average length of time of exposure of the lower right first permanent molar in the mouths of boys eight years of age who represent the first 25 per 100 boys to

[10] The actual calculation of this value may be accomplished as follows: from Pearson's Tables for Statisticians and Biometricians, (Second Edition, 1924, page 2) it may be found that the integral of the normal curve is 0.25 for the argument

$$\frac{x-m_x}{\sigma_x} \text{ equals } -0.67449,$$

where m_x is the mean and σ_x is the standard deviation of the normal curve. Since the particular normal curve under discussion has its mean at 6.44 years and its standard deviation equal to 0.75 years, solution of the equation

$$-0.67449 = \frac{x-6.44 \text{ years}}{0.75 \text{ years}}$$

shows that x equals 5.93 years. Thus, the chronological age of 5.93 years represents the age at which 25 per cent of the boys have the lower right first molar erupted into the mouth.

[11] The actual calculation of this value may be accomplished as follows:

From the table of the double integral of the normal curve given in reference (5) it readily may be determined by simple interpolation that

$$\int_{-\infty}^{-0.67449} \int_{-\infty}^{-0.67449} \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}x^2} \, dX \, dX = 0.1492$$

The value of 0.1492, which is the value of the double integral in terms of a standard deviation equal to unity, is transformed into years of exposure by multiplying this value by 0.75 (the standard deviation of the normal curve under discussion). In order to furnish a more easily interpreted expression of tooth years of exposure for the children in a single quartile group, the years of exposure given directly above may be multiplied by four. Thus, 0.1492 times 0.75 times 4 equals (approximately) 0.45 years.

have this tooth appear in the mouth. Obviously, the exposure of the two lower first molars in the mouths of these boys is double this value or 5.04 years. Calculations similar to those given for this particular example may be made to furnish analogous figures for the years of exposure in the mouths of other subdivisions of the distribution of the time of eruption of these and other teeth. The technique described here provides very useful data for the problem under discussion in this paper.

The third successive step in the study of the relationship between caries experience and the time of eruption of the teeth consists, through the use of the procedure which has been illustrated above, of the determination of the tooth years of exposure for each of the quartile subdivisions of each age-sex group of children. The results of this work are shown in Table 5, and at this point it is necessary to discuss an important assumption which is made in connection with the derivation and use of the figures given in this table.

TABLE 5

AVERAGE POST-ERUPTIVE TOOTH AGE, YEARS OF EXPOSURE IN THE MOUTH, OF THE LOWER FIRST PERMANENT MOLAR TEETH; BY QUARTILES OF DISTRIBUTIONS OF CHILDREN ARRANGED ACCORDING TO TOTAL NUMBER OF PERMANENT TEETH ERUPTED. DATA DERIVED FROM DENTAL EXAMINATIONS OF 4,416 ELEMENTARY SCHOOL CHILDREN, HAGERSTOWN, MARYLAND

	AGE								
Quartile	6.5	7.5	8.5	9.5	10.5	11.5	12.5	13.5	14.5	15.5
BOYS										
First	*	0.43	2.22	4.21	6.21	8.21	10.21	12.21	14.21	16.21
Second	0.01	1.63	3.63	5.63	7.63	9.63	11.63	13.63	15.63	17.63
Third	0.61	2.61	4.61	6.61	8.61	10.61	12.61	14.61	16.61	18.61
Fourth	2.03	4.03	6.03	8.03	10.03	12.03	14.03	16.03	18.03	20.03
GIRLS										
First	*	0.72	2.56	4.55	6.55	8.55	10.55	12.55	14.55	16.55
Second	0.26	2.20	4.20	6.20	8.20	10.20	12.20	14.20	16.20	18.20
Third	1.32	3.32	5.32	7.32	9.32	11.32	13.32	15.32	17.32	19.32
Fourth	2.97	4.97	6.97	8.97	10.97	12.97	14.97	16.97	18.97	20.97

* According to the theoretical development on which this table is based, no lower molar teeth are erupted by the age of 6.5 years in the mouths of children in the first quartile

Briefly, this consists of the assumption that the measure of the relative time of eruption of all of the permanent teeth, that is, counts of the total number of erupted teeth, is precisely correlated with the time of eruption of a single morphological type of tooth, the lower first molar. Thus it is assumed that the 25 per cent of the children who have the fewest number of erupted teeth actually represent the 25 per cent of the children who are last to have the lower first molar appear in the mouth. Similarily, the 25 per cent of the children who have the largest number of erupted teeth are assumed to be that 25 per cent of the total group who were the first to have the lower first molar erupt. Observational data with which to justify this assumption are not available but it seems reasonable to believe that this broad grouping of the

children into quartile classes on the basis of total number of erupted teeth also serves to group the children into broad and fairly well differentiated classes with respect to the relative time of eruption of the lower first molar.

Careful consideration of the method used in the derivation of post-eruptive tooth ages, as given in Table 5, will reveal the fact that the years of mouth exposure which are recorded represent averages for children at an exact chronological age. For example, the figure of 4.02 years given in Table 5 for the post-eruptive tooth age of boys in the fourth quartile who have a chronological age of 7.5 years, represents the average length of time the lower first permanent molar teeth are exposed in the mouth when these boys are exactly 7.5 years of age. Similar consideration of the data given in Table 4 will reveal the fact that the percentages of first molar teeth attacked by caries represent averages for groups of children whose chronological ages range over a one year span which only centers at an exact chronological age. For example, the figure of 31.3 per cent given in Table 4, as the per cent of lower first molars attacked by caries for boys in the fourth quartile who were recorded as seven years of age on their last birthday, represented an average of 7.5 years for boys whose actual ages range from seven to eight years. From this discussion it is apparent that the values of 4.02 years and 31.3 per cent, which apply in the above example, constitute somewhat different types of averages. The former represents a simple mean of the lengths of time the teeth of the particular group of children are exposed in the mouth; the latter represents an average with respect to the two variables, teeth and chronological age. While both types of averages, such as are illustrated by the figures 4.02 and 31.3, are very frequently obtained in practical statistical work, it has seemed desirable to bring out the point that a distinction does exist between them. In particular it appears pertinent to stress this distinction since the final results of the study will be expressed in terms of a direct comparison of these two types of averages. Thus it seems justifiable to state that, after an average exposure of 4.02 years in the mouth, an average of 31.3 per cent of the lower first molars of boys in the fourth quartile has been attacked by caries. In a similar way, after an average exposure of 6.02 years, boys of the fourth quartile class show 52.0 per cent of their lower first molars attacked by caries.

RESULTS

Acceptance of the data given in Table 5 as satisfactory measurements of the time of exposure in the mouth of the lower first molar teeth specific for the several quartile groups of children and of the data given in Table 4 as satisfactory measurements of caries experience, permits a full comparison of these two variables. Figures 4 and 5 show, therefore, the results of graphic presentations of the relationship between caries experience and post-eruptive tooth age for the four groups of boys and girls who are differentiated with respect to the relative time of eruption of the teeth. In these graphs the abscissae show average post-eruptive tooth age and the ordinates show the per cent of lower first permanent molars attacked by caries. The data shown on the graphs represent the results of plotting corresponding values of tooth age and per cent of teeth DMF as shown in Tables 4 and 5, and separate lines show the relationship between these two variables for the four quartile groups of children. Careful study of these graphs indicates that rather slight differences appear to exist between the several quartile groups of children when comparisons in attack of the teeth by caries are made in terms of the length of time the teeth are exposed to the environment of the mouth. Thus it is clear that caries attack rates are very similar for the first part of the range of post-eruptive tooth age. In the central part of the range over which comparisons are made, however, it is evident that children in both

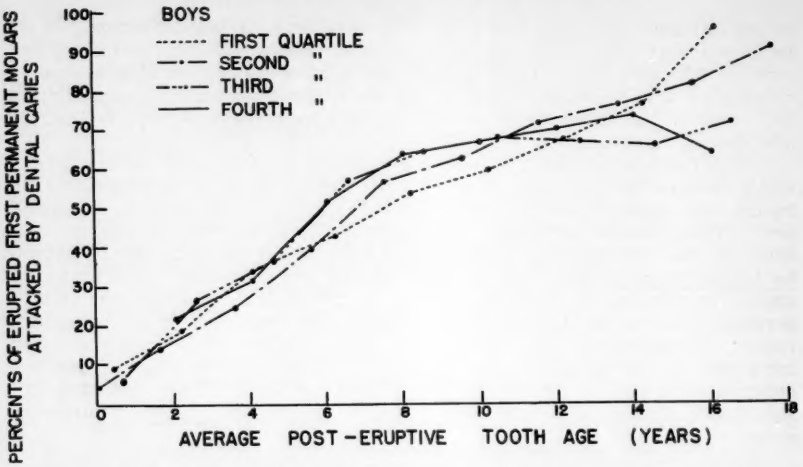

Fig. 4. The relationship between post-eruptive tooth age and per cent of lower first permanent molars attacked by caries. Four quartile groups of children differentiated with respect to time of eruption of the teeth. Boys.

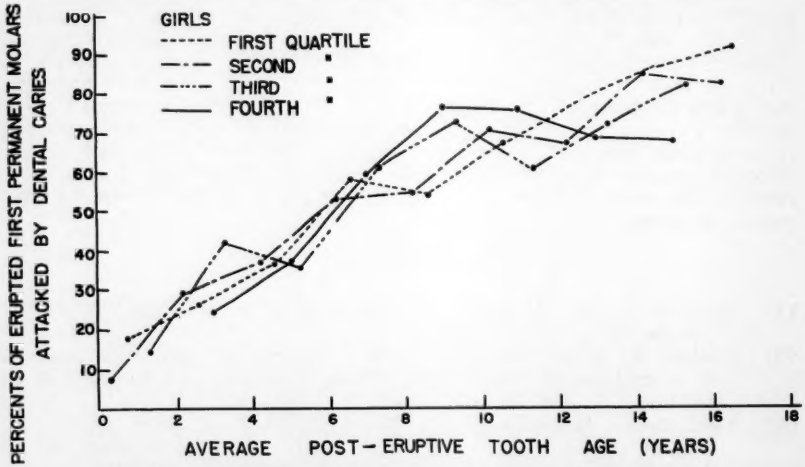

Fig. 5. The relationship between post-eruptive tooth age and per cent of lower first permanent molars attacked by caries. Four quartile groups of children differentiated with respect to time of eruption of the teeth. Girls.

the third and fourth quartiles appear to have slightly higher caries attack rates than children in the first and second quartiles whose teeth have had an equivalent period of exposure in the mouth. A test for the statistical significance of the differences between the quartile groups presents a rather difficult problem and will not be attempted here in terms of rigorous statistical methodology. However, the maximum difference which exists between the individual quartile groups is of the order of 15 per cent. In order that such a difference

be statistically significant (twice the standard error of the difference), it may be shown that the two groups being compared would need to contain of the order of 90 cases each. Since none of the quartile groups contains as many children as this, it becomes evident, on the basis of the present approximations, that none of the differences between these groups individually can be considered statistically significant.[12]

The findings presented in this paper clearly indicate that children who erupt their permanent teeth early may be expected to have at comparable chronological ages higher levels of caries experience than children who are late eruptors. These marked differences in caries experience, however, are explained by the fact that the teeth of early eruptors have been exposed to the risk of caries for longer periods of time than the teeth of late eruptors. The analysis would appear to demonstrate that, per year of mouth exposure (tooth age), early eruptors show no significant differences from late eruptors in their caries attack rates. Taking all the findings together, and especially those derived from the comparison of the quartile groups over the first part of the range of post-eruptive tooth age, it may be concluded that the present study furnishes no significant evidence to indicate that the time of eruption, per se, influences caries attack rates of the lower first permanent molars.

SUMMARY AND CONCLUSION

The study presents a statistical analysis of the relationship between the time of eruption of the lower first permanent molars and attack of these teeth by caries. Data for the analysis are derived from a dental survey of approximately 4,400 elementary school children of Hagerstown, Maryland. Results of the study show that children who erupt their permanent teeth early have at comparable chronological ages higher absolute levels of caries experience than do children who erupt their permanent teeth late. The analysis of these differences in caries experience in terms of respective differences in the tooth years of mouth exposure leads to the conclusion that little relationship appears to exist between time of eruption, per se, and attack of the lower first permanent molar, by caries.

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[12] Study of the data given in Figures 4 and 5 at the middle part of the range of post-eruptive tooth age suggests that early eruption may intensify attack by caries in the molar teeth. The analysis of the statistical significance of this selected section of the experience is under study at the present time.

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STUDY OF THE CHARACTERISTICS OF 250 JUNIOR HIGH SCHOOL CHILDREN[1]

J. ALLAN HICKS AND MARGARET HAYES[2]

INTRODUCTION

This is a report of an investigation of the personality development of a group of 250 junior high school children. By means of interviews, controlled observations, objective tests, ratings, and other data obtained by the school, a fairly comprehensive picture of the development of this group was obtained.

The general purpose of this study was to obtain a comprehensive picture of a group of developing adolescents. A more specific purpose was to compare the development of the best adjusted and intellectually promising children, with the development of the other children in their classes. It was hoped that differences might be discovered which could be looked for as clues in locating potential leaders. Finally, all information was to be utilized in developing the guidance program of the school, so that the educational, vocational, and personal needs of children might be met more adequately.

The 250 children included in this study attended the Milne High School, Albany, New York. The Milne School is the practice school for the New York State College for Teachers and annually enrolls approximately 400 students distributed about equally in the six grades, 7 to 12 inclusive. This school has well developed junior and senior high school programs. The teaching is done largely by senior college students under expert supervision.

GROUPS STUDIED

All of the junior high school children were divided into four groups hereafter designated as leadership groups. Table 1 indicates the number of boys and girls in each of the four leadership groups for each of the one year age groups and for age and sex groups combined. It should be noted in interpreting the data in this study that the method of selection for placement in groups resulted in placing an excessive number of girls in groups 1 and 2.

The four leadership groups were determined by combining each child's ranking in his class on an intelligence quotient, an achievement quotient, and a personality rating. Table 2 gives the medians for these measures for each of the four groups. Group 1 is approximately the one quarter of the pupils ranking highest on the combined three measures; group 2 is the next one fourth of the children on the basis of this ranking; group 3 the next one fourth, and group 4 the last one fourth. The intelligence quotients were computed from scores on the Otis Self-administering Tests of Mental Ability, Intermediate Examination; the achievement quotients from total scores on the Stanford Achievement Tests; and the personality ratings from ratings of pupils by home room teachers on an adaptation of the personality report, revision B, of the American Council on Education.

On the personality rating the following five questions were marked for each pupil on a five point scale:

1. How are you and others affected by his appearance and manners?
2. Does he need constant prodding or does he go ahead without being told?

[1]This study of adolescent development was made possible by a grant from the Laura Spelman Rockefeller Foundation to the New York State College for Teachers. Acknowledgments are made to Dr. A. R. Brubacher, President of the College, and Professor John M. Sayles, Head of the Department of Education, for placing the facilities of the college and the high school at the disposal of the authors.

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3. Does he work well with a group?
4. Does he get others to do what he wishes?
5. Is he able to do creative work?

A personality score was obtained by scoring each trait from one to five according to the rating on the trait. The maximum score obtainable was 25 and the minimum 5.

TABLE 1

CHILDREN IN STUDY OF ADOLESCENT PERSONALITY, BY LEADERSHIP, AGE, AND SEX GROUPS

Leadership Group	Age						All Ages
	11	12	13	14	15	16	
Girls							
1	8	8	9	5	3		42
2	4	8	13	6	9	5	45
3	3	5	8	6	11	4	37
4	3	4	7	3	2	5	24
All	18	25	37	24	27	17	148
Boys							
1	5	3	5	5	2	1	21
2	2	6	3	1	4	2	18
3	3	5	7	4	2	6	27
4	2	4	7	6	10	7	36
All	12	18	22	16	18	16	102
Boys and Girls							
1	13	11	14	14	7	4	63
2	6	14	16	7	13	7	63
3	6	10	15	10	13	10	64
4	5	8	14	9	12	12	60
All	30	43	59	40	45	33	250

TABLE 2

INTELLIGENCE QUOTIENTS, EDUCATIONAL QUOTIENTS, AND PERSONALITY SCORES OF PUPIL LEADERSHIP GROUPS

Leadership Groups	Number	Intelligence Quotients		Educational Quotients		Personality Scores	
		Median	Q	Median	Q	Median	Q
1	63	125		132		20	
2	63	117		118		17	
3	64	113		103		16	
4	60	107		98		12	
Total	250	115	5.6	114	11.5	16	3

An analysis of the occupations of the fathers of the children in this study revealed that 20 per cent were in occupations listed in Group I of the United States Census classification, 55 per cent were in Group II, 10 per cent in Group III, and 15 per cent were retired, divorced or dead. Of the mothers 87 per cent were housewives, 8 per cent were dead or divorced, and 5 per cent were employed.

Of the 250 children included in the study, 24 per cent were only children, 36 per cent had one sib, 20 per cent had two, 12 per cent had three, 5 per cent had four, and 2 per cent had five. The average number of children per family was 2.4.

In 64 per cent of the families no adults other than the parents were living in the home. In 29 per cent a relative, most often a grandmother, lived with the family. Thirteen per cent of the families had servants living in the home

and 9 per cent had paying roomers.

There were no significant differences relative to occupations of parents, numbers of children, or other adults living in the home between the four groups of children.

Throughout this study data are generally given for leadership groups 1 and 4 separately and combined, and for sex groups, separately and combined. In some cases data are also given for groups 2 and 3.

THE DATA

The data obtained will first be briefly described and then analyzed under each of the following headings:

1. Standardized test results.
   a. Intelligence quotients obtained from the Otis Self-administering Tests of Mental Ability, Intermediate Examination.
   b. Achievement quotients obtained from the Stanford Achievement Tests.
      (1) Total Arithmetic quotient.
      (2) Arithmetic computation quotient.
      (3) Arithmetic reasoning quotient.
   c. Reading quotient from Thorndike-McCall Tests.
2. Interviews.

The 123 children in groups 1 and 4 were given a standardized interview in order to obtain more reliable information regarding the interests, desires, and activities of the children than could be obtained by questionnaires. The interviewer conducted these interviews in an informal manner and obtained excellent cooperation. Very few notes were taken during the interview, but data were recorded immediately after the conclusion of the interview.

3. Personality ratings.

All children were rated by their teachers on the Hayes, "Scale for Evaluating the School Behavior of Children, Ten to Fifteen."[3] This scale consists of 100 behavior items which are grouped under the headings: (a) relations to others generally, (b) respect for rights of others, (c) relations to teachers, (d) relations to other pupils, (e) initiative, (f) health habits, (g) general interests, (h) scholarship and study habits. The test manual gives score values for each item on the scale and percentile norms for the whole scale and for each of the eight sub groups.

4. Health data.

All children were given a physical examination and a general health rating was assigned. The highest rating was A and the lowest E. In addition various physical defects were listed.

5. Observations of verbal responses in classroom discussions.[4]

A code system was devised for recording pupil responses on a seating chart. All pupils in a class were observed simultaneously by the observer for units of 20 minutes. Classes observed were English, Social Science, Mathematics, and General Science. The average size of the classes was 20 pupils and the range 11 to 27. Each student was observed twice in each class so that there were 8 observations for each of the 250 children, and a total of 2000, 20-minute observations. The average number of responses for 20 minutes for each of the types of response recorded was computed for the four leadership

[3] Hayes, M. L., "A scale for evaluating the school behavior of children, ten to fifteen." Scale published by the Psychological Corporation, 522 Fifth Avenue, New York City. For article describing the scale see, Hayes, M. L., "A scale for evaluating adolescent personality." Ped. Sem. and J. Genetic Psychol., 1934, 44, 206-222.

[4] For description of this technique see, Hicks, J. A., and Hayes, M. L., "The verbal responses of junior high school pupils in classroom discussions." Child Development, 1933, 4, 176-182.

groups. For purposes of analysis the responses were grouped under three heads: (1) responses indicating command of subject matter, (2) responses indicating desirable aggressiveness, and (3) responses indicating undesirable aggressiveness.

6. Subject matter grades.

The percentage grades given by teachers in the various subjects are analyzed for leadership groups and for sex groups.

7. Progress through the grades.

The number of grades skipped or repeated is compared for leadership groups.

STANDARDIZED TESTS

Table 3 gives the medians and quartile deviations for intelligence, reading, and arithmetic quotients for leadership and sex groups. Table 3 shows that the median intelligence quotient for boys and girls combined is 125 for leadership group 1, 117 for group 2, 113 for group 3, 107 for group 4, and 115 for all groups combined. There are no pupils with an I.Q. below 90. Thus

TABLE 3

INTELLIGENCE, READING, AND TOTAL ARITHMETIC QUOTIENTS, FOR LEADERSHIP AND SEX GROUPS

Leadership Group	Intelligence Quotients		Reading Quotients		Arithmetic Quotients	
	Median	Q	Median	Q	Median	Q
Girls						
1	124	3.9	131	5.5	133	6.6
2	116	3.3	117	6.4	120	10.5
3	113	2.9	110	8.0	111	7.3
4	110	4.7	101	5.3	104	8.8
Total	116	5.3	116	11.0	121	11.2
Boys						
1	128	3.4	132	5.4	138	8.1
2	118	3.4	117	6.4	115	14.4
3	113	3.2	108	11.0	116	5.0
4	105	4.4	94	14.7	108	9.2
Total	114	6.6	114	14.7	116	10.6
Boys and Girls						
1	125	3.7	131	7.4	134	7.1
2	117	3.3	117	6.3	119	11.7
3	113	3.1	117	8.3	113	6.6
4	107	5.1	100	10.2	106	9.1
Total	115	5.6	115	11.3	118	11.2

all of the children are average or above in intelligence, as measured by tests. The quartile deviations are relatively small, indicating that the variability in I.Q's is not great. It is evident that the children studied are above the level of intelligence found in most public high schools. Even leadership group 4 has a median I.Q. of 107. These facts should be borne in mind in interpreting the data of this study. There are marked differences in the measures on the four leadership groups but the differences are relative. In so far as a picture of the nature and needs of the whole group of children studied is given, it is a picture of children of average or above average in intelligence as measured by tests.

An examination of the reading quotients given in Table 3 indicates a

situation similar to that for the intelligence quotients. The reading ability of the children on the whole is high as indicated by a median of 115 for the total group. There is, however, greater variability in quotients as shown by the fact that the quartile deviations for every group are nearly twice as large as the corresponding quartile deviations for intelligence quotients. This greater variability is also shown by the fact that the difference between the median reading quotient of leadership group 4 and leadership group 1 is 30 (131 - 101), while the difference between the median intelligence quotients for these two groups is 18 (125 - 107).

The total arithmetic quotients given in Table 3 present a picture practically the same as that shown by the reading quotients, except that the arithmetic medians run somewhat higher than the reading medians. None of the groups is low but the variability is greater than for the intelligence quotients. The arithmetic quotients for computation and reasoning computed separately are not given in Table 3. The data for these phases of arithmetic show a similar situation as described for the total arithmetic quotients except that the median computation quotients are higher than the median reasoning quotients for each leadership and sex groups. The median reasoning quotient for the total group is 114 and the median computation quotient, 123. The median computation quotient for girls is 127 and the median reasoning quotient 115. For boys the median computation quotient is 118 and the median reasoning quotient 113.

INTERVIEWS

This section is an analysis of information obtained by means of a personal interview. Only the 63 children in leadership group 1 and the 60 children in group 4 are included in this part of the study. Inasmuch as it was necessary for one person to conduct all of the interviews, time did not permit including the pupils of groups 2 and 3.

It may be questioned whether the data thus obtained give a fair picture of the total group, since the middle half of the pupils were omitted. As will be seen, however, the differences in the two groups were usually not great and a pooling of the results of the upper and lower groups probably gives a fairly accurate picture of the entire group of children.

The two groups are also compared in an attempt to discover differences which might be used in discovering potential leaders, as defined in this study. Also from a guidance point of view it was hoped that a discovery of differences in pupils of such groups might make it possible to develop a guidance program better adapted to pupils of different levels of leadership ability. For example, are there significant differences in the interests or the home backgrounds of pupils who rank high in intelligence, scholastic achievement, and on general personality ratings by teachers as compared with children who rate low on these three measures, that should be taken into account in the guidance program? It is recognized that in the final analysis guidance is an individual matter but in schools children must be dealt with both in groups and as individuals. Therefore, knowledge of general group tendencies is helpful in an attempt finally to know each individual pupil thoroughly and provide the education which is best for individual pupils.

The students were informed that the information was being obtained in order that those in charge of the school might be able to adjust the school program to the needs of the students. As all cooperated in an excellent spirit, it is felt that the data obtained are reliable in so far as the students were able to give accurate responses.

The data obtained by use of the interview were grouped under the following main headings and will be analyzed in the order given:

1. Family relationships and home and community backgrounds.
2. Interests.
   a. General.
   b. Social, recreational, and cultural.
   c. School.
   d. Vocational.
   e. Religious.
3. Emotional and imaginative life.
4. Mental and physical health.

FAMILY RELATIONSHIPS AND HOME AND COMMUNITY BACKGROUND

Magazines Read by Parents

The parents most frequently read such magazines as "The Saturday Evening Post," "Good Housekeeping," and "The Ladies Home Journal". About 25 per cent read some magazine of a non-fiction type. Group 1 parents read more magazines of a substantial non-fiction type.

Books in The Home

Fifty-six per cent of the parents of the children in this study had 125 or more books in the home while only 13 per cent had fewer than 25 books. The differences between the parents of group 1 and 4 were small. While numbers of books are not indicative of the kind or quality of books, the numbers give some notion of this phase of the home backgrounds of the children.

Where Children Spend Their Evenings

On the average the children reported spending 5.4 nights a week at home. The girls spent an average of 5.7 nights at home and the boys 5.1. Group 1 were home 5.7, and group 4, 5.2 nights a week. The indications are that girls spent more evenings at home than boys and the children of group 1 were at home more evenings than the children of group 4.

What Pupils Do Evenings

An average of 4.6 nights a week the children listened to the radio at least part of the evening. They studied some, 3.9 evenings a week, read 3.9 evenings, and played games .9 of an evening. The girls studied more and read more than the boys. Also group 1 children read and studied markedly more than the children in group 4, but played games somewhat less.

Evenings Children Have Had Children Come to Their Home or Have Gone to Friends' Homes.

Group 4 had friends come to their home or went to friends' homes less frequently than group 1. This is particularly true of the group 4 girls, as 75 per cent of them had not had a friend visit them and 71 per cent had not gone to a friend's home in the week reported.

Where Children Play

The children played most frequently in backyards, with vacant lots next in frequency. The boys played more in vacant lots than girls, while the girls played more often in back yards at home and in the park than did boys. Group 1 played more often in back yards at home or at a friend's home than group 4 but they played less at the park.

Play with Sibs

About one-third of the children were either only children or had no brothers or sisters at home at the time of this study. The girls spent more time with sibs than boys. More of group 1 than group 4 did not have a sib at home but of those who did a larger percentage than of group 4 spent much time with them.

Tell Mother or Father Troubles and Joys

An analysis of these data indicated no appreciable differences between groups 1 and 4. For the boys of both groups combined, 51 per cent said they often told their mother their troubles and joys and 30 per cent told their fathers. Of the girls 76 per cent confided in their mothers, and 39 per cent in their fathers. There is an indication that girls of this age confide in their parents more often than boys, and both boys and girls confide more in their mother than in their father.

Unfairness, Unreasonable Demands and Favoritism

Only 5 per cent of the children said they thought their parents or others were unfair to them. Four per cent said they thought another child in the family was favored. Of these, 19 per cent of the boys and 9 per cent of the girls thought other children were favored.

Nervousness of Parents

Nineteen per cent of the children thought their mothers were often nervous and 26 per cent that they were sometimes nervous. Only 5 per cent thought their fathers were often nervous and but 9 per cent that they were sometimes nervous.

Methods of Discipline

The methods of discipline in order of frequency of mention were: reasoning, scolding, and deprivation of pleasures. Seventeen per cent said they were not disciplined at all.

Things Parents Do Not Like

Table 4 indicates the things the children did which they said their parents did not like. Coming home late, quarreling with sibs, teasing sibs, and disobedience lead the list. Twenty-four children said they did not do anything their parents disliked. Many other behaviors were listed once or twice.

TABLE 4

NUMBER OF CHILDREN MENTIONING THINGS PARENTS DID NOT LIKE

	Fathers and mothers combined
None	24
Coming home late	17
Quarreling with sib	15
Teasing sib	12
Disobedience	11
Carelessness	7
Forgetting	6
Bad companions	4
Untidiness	4
Smoking	4
Too noisy	3
Won't practice music	3

Reading Aloud in the Home

No one had read aloud in the home in the previous month in 77 per cent of the families represented. In 21 per cent of group 1 homes and in 15 per cent of group 4 homes some one had read aloud three or more times.

Games or Sports Played by Parents

Cards, golf, swimming, and tennis were the leading games or sports of fathers, in the order named. For mothers the order was cards, swimming, and golf. Seventeen per cent of the fathers and 22 per cent of the mothers played no games or sports, according to their children. About half of the parents sometimes played these games or sports with their children.

Help at Home

About 90 per cent of the children said they helped with the work at home. The duties most frequently mentioned were: setting the table, running errands, caring for own room, mowing the lawn, and weeding the garden.

Radio in Home and Study With Radio

All of the children but one girl in group 1 came from a home which had a radio. About 40 per cent of the children in group 1 studied with the radio on and about 17 per cent of group 4. The difference is puzzling. Most of the children who studied with the radio on thought it did not bother them while most of the others thought it did. It would be interesting to know more about the part played by parents in this matter.

Allowance

Table 5 indicates the percentages of children who were given an allowance and the percentages who earned money. Group differences are small but more girls in both groups had allowances whereas more boys earned money. The median weekly allowance was $1.00 and the range from $.25 to $2.60. Money was earned most frequently by running errands, doing odd jobs, caring for children (girls only), shoveling walks, and mowing lawns.

TABLE 5

PERCENTAGES OF CHILDREN GIVEN AN ALLOWANCE AND EARNING MONEY

	Groups								
	1			4			All		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
Allowance	52	60	57	47	58	52	49	59	54
Earning Money	76	45	56	86	50	72	81	45	61

INTERESTS--GENERAL

Travel

Of the children studied, one per cent had traveled abroad, 60 per cent had been in five or more states other than New York, 30 per cent had been in one to four states other than New York, and 10 per cent had never been out of New York.

Clubs and Organizations Outside School
Membership and Offices.

Forty per cent did not belong to any organization. The organization most frequently mentioned by both boys and girls was the scouts. Forty-five per

cent belonged to this organization. Twenty-two per cent held some office in an organization. (29 per cent of the girls and 12 per cent of the boys.) Twenty-nine per cent of group 1 held offices and 13 per cent of group 4. The office most often held was that of patrol leader.

Organization of Clubs or Groups

The children of group 1 had been somewhat more active in organizing clubs and gangs, especially the boys. The organizations most frequently mentioned in the order of frequency were, secret clubs, 21 per cent; athletic clubs, 18 per cent; dramatic organizations, 8 per cent; sewing, social and detective organizations, each 5 per cent. Many others were mentioned less frequently.

Activities Out of School Liked Best

Many activities were mentioned by one or two children, but sports and reading were most frequently given. Table 6 gives the percentages of these two activities. It may be noted that 24 per cent of group 1 and but 8 per cent of group 4 gave reading. The girls in both groups gave reading more frequently than the boys. There are indications here that the children in group 4 liked sports better than the children in group 1 and were less fond of reading.

TABLE 6

PERCENTAGES OF CHILDREN LIKING ACTIVITIES OUT OF SCHOOL

	Groups								
	1			4			All		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
Sports	62	55	57	83	75	80	75	62	68
Reading	10	31	24	3	17	8	5	26	16
Others	28	14	19	14	8	12	20	12	16

INTERESTS--SOCIAL, CULTURAL, AND RECREATIONAL

Sports Liked Best

Table 7 indicates the sports given by 10 per cent or more of the children as a first choice. Swimming was most popular for the children as a whole (62 per cent). It was most popular for the girls in both groups, and for the boys in group 4, football was most popular.

TABLE 7

PERCENTAGES OF FIRST CHOICES OF SPORTS LIKED BEST

	Groups								
	1			4			All		
Sport	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
Swimming	62	79	73	44	63	52	51	73	62
Ice Skating	33	14	21	22	50	33	25	39	32
Basket ball	29	33	32	47	25	38	42	18	29
Baseball	38	17	24	42	13	30	40	15	26
Football	38	0	13	61	0	37	53	0	24
Tennis	14	17	16	14	17	15	14	17	15
Skiing	14	14	14	11	8	10	12	12	12
Riding	10	17	14	0	13	5	4	15	10
Hiking	5	17	13	8	0	7	7	12	10

Magazines Read

Table 8 gives the percentages of children reading various magazines in one month. It is evident that the children of group 1 read more magazines. Thirty-three per cent of the girls in group 4 had not read a magazine in a month. There are also indications that both the boys and girls in group 1 read a greater variety of magazines, particularly of non-fiction type.

TABLE 8

PERCENTAGES OF CHILDREN READING MAGAZINES IN ONE MONTH

Magazine	Groups 1			4			All		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
Boy's Life	33	0	11	44	8	30	40	3	20
Am. Boy	52	2	19	31	0	18	39	2	18
Open R'd.for Boys	43	2	16	31	4	20	35	3	17
Am. Girl	5	31	22	0	29	12	2	30	17
Sat. Evening Post	19	10	13	25	8	18	23	9	15
Child Life	14	31	25	0	8	3	5	23	15
None	5	14	11	8	33	18	7	21	15
Good Housekeeping	0	21	14	8	8	8	5	17	11
Literary Digest	10	10	10	11	8	10	11	9	10
Ladies Home Jr.	5	21	16	0	8	3	2	17	10

Books Read Not Required by Teacher

Table 9 gives the number of books read in one month not required by the teachers. Group 1 children had read a great deal more. Thirty-five per cent of group 4 and but 3 per cent of group 1 had not read one book. Sixty-one per cent of group 1 and but 26 per cent of group 4 had read three or more books. More girls than boys had read two or more books and of the girls in group 4, 46 per cent had not read one book.

TABLE 9

PERCENTAGES OF CHILDREN READING BOOKS NOT REQUIRED BY TEACHER

No. of books	Groups 1			4			All		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
0	0	5	3	28	46	35	18	20	18
1	19	7	11	39	8	27	32	8	18
2	24	26	25	14	8	12	18	20	18
3	24	31	29	17	29	21	19	30	25
4	14	10	11	0	4	2	5	8	7
5	10	14	13	0	4	2	4	11	7
6+	9	7	8	2	1	1	4	3	7

Radio Programs Listened to and Liked

Only four children said they did not like to listen to the radio at any time. Table 10 gives the percentages of children listening to various types of programs and the number of hours they listened each day. The children often gave two or three types as of equal interest, hence the table indicates the frequency of mention rather than first choices. The table shows that 66 per cent of the children listened an hour or more a day and 11 per cent listened three hours or more. As many children studied with the radio on, they probably listed time so spent as both studying and listening to the radio. Humorous sketches were most popular. Popular music was liked by more group 4 than group 1 children. The table does not give data for sexes as the differences

were not significant.

TABLE 10

TIME SPENT LISTENING TO RADIO AND PROGRAMS LIKED, IN PERCENTAGES OF CHILDREN

	Groups		
	1	4	All
Three hours or more	11	10	11
One to three hours	61	71	66
Less than one hour	39	29	34
Programs liked			
Humorous sketches	86	83	85
Plays	40	55	47
Popular music	27	62	43
Classical music	16	15	15

Attendance at Movies and Pictures Liked

Of the 123 children studied, 11 went to movies more often than once a week and 28 went less often than once a week. Ninety per cent said they liked movies if they were the right kind. Table 11 gives the percentages of children liking different types of movies. The children gave the types of movie that they liked and these were then tabulated according to the classification given in the table. Group 1 children liked dramatic pictures better than group 4, whereas group 4 children liked mystery stories better than group 1. More girls than boys liked romantic pictures.

TABLE 11

PERCENTAGES OF CHILDREN LIKING DIFFERENT TYPES OF MOVIES

Type of Movie	Groups								
	1			4			All		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
Dramatic	52	31	37	9	8	8	25	23	23
Humorous	24	7	13	11	8	10	16	8	11
Mystery	5	5	5	14	17	15	11	9	10
Romantic	0	26	17	0	4	2	2	17	9
Juvenile	0	26	17	0	0	0	0	15	9

Children Who Like Parties and Can Dance

As shown in Table 12, groups 1 and 4 were similar in liking parties but more girls could dance (83 per cent as opposed to 58 per cent of the boys). The reasons most frequently given for liking parties were that they liked dancing and games.

TABLE 12

PERCENTAGES OF CHILDREN WHO LIKED PARTIES AND COULD DANCE

	Groups								
	1			4			All		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
Like parties	76	95	89	89	83	87	84	88	87
Can dance	38	83	68	69	83	76	58	83	71

Special Chums

Seventy-seven per cent of the children said they had a special chum. No group or sex differences were found. The chief reasons given for liking the chum were: likes the same games and sports, can do interesting things, and have known a long time.

Apparently children are not really well aware of reasons for liking a chum for they evidenced difficulty in expressing reasons.

Eighty per cent of the children said they liked to have a great many friends. A few said they preferred a few close friends. Only 7 per cent said they liked to play alone. Seventy-nine per cent said they belonged to a play group or gang. Considering groups, 73 per cent of group 1 and 87 per cent of group 4 said they belonged to a play group.

There are indications that group 4 children were somewhat more socially inclined than group 1 children.

INTERESTS--SCHOOL

Reasons for Liking the School

No clear differences between groups or sexes were discovered in studying the answers to this question. The reasons for liking the school most frequently given by all the children in this study in order of frequency of mention were: liked the teachers, liked the school work, liked the social activities, liked the methods of teaching, liked the way the school was run, and liked the extra-class activities.

Suggestions for Improving the School

Many suggestions for improving the school were given but most of these were related to improvement of school discipline and routines, and to a better extra-class activities program. It is interesting that in general these children wanted the school to be orderly. Forty-one of the 123 pupils interviewed said they would prefer better discipline in classes than now prevails. Even children with a record of misbehavior frequently expressed the belief that teachers ought to maintain good order. As one child said, "Teachers should be more strict; children will make more noise if the teacher lets them, but nobody really enjoys a noisy classroom." The suggestions of the children in group 1 were in general more constructive and detailed than those of the children in group 4. Group 1 children more frequently mentioned matters pertaining to student government while group 4 children more frequently mentioned extra-class activities.

Reasons for Working for Good Grades

Table 13 was prepared by grouping the many answers of the children to this question. Preparation for college was mentioned most frequently even by group 4 children. A high percentage of pupils in the Milne school go to college but many of the children giving this reason probably did so because it is "the thing to do" or at least to say you are doing. Group 1 children frequently said they were working for good grades to please their parents and because of the satisfaction they got from the work. Group 4 children stressed preparation for vocations. Twelve per cent of this group said they were mainly concerned with getting through school. Of the 14 per cent who gave no reason many probably belong in this classification. It should be remembered that in general the grades of group 1 children were much higher than those of group 4 children so that they were achieving success in this way, whatever may have been their motives. The small number of children, especially in group 4, mentioning satisfaction in the work, may indicate a lack of intrinsic motivation in much of the work.

TABLE 13

REASONS FOR WORKING TO MAKE GOOD GRADES, IN PERCENTAGES OF CHILDREN MENTIONING

Reasons	Groups								
	1			4			All		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
College preparatory	38	24	28	38	24	28	43	25	33
Vocational preparatory	20	11	15	30	47	47	22	31	24
To please parents or teachers	33	38	37	6	8	7	17	28	20
No reason	14	28	26	8	17	14	13	27	19
Satisfaction in the work	10	36	27	9	4	6	12	23	16
Competition	15	12	13	8	17	14	12	8	9
Get through school	5	0	2	17	4	12	12	2	7
Avoid failure	0	0	0	6	0	3	2	0	2

Subjects Liked and Disliked

Table 14 gives the subjects the children said they liked or disliked most for groups 1 and 4 combined. Only subjects taken by all the children were included in this comparison. The data for groups 1 and 4 are not given separately as no clear differences were found.

For the children as a whole no subjects were outstandingly popular or unpopular. English was far more popular with the girls and mathematics with the boys.

TABLE 14

SUBJECTS LIKED AND DISLIKED, IN PERCENTAGES OF CHILDREN

	Liked best			Disliked most		
	Boys	Girls	All	Boys	Girls	All
Mathematics	25	15	19	14	24	19
English	5	26	16	28	8	17
Social studies	14	9	11	9	18	14
Science	14	6	10	12	17	15
Other subjects or none mentioned	42	44	44	37	33	35

The dislikes were in agreement with this trend. More boys disliked English than any other subject, whereas more girls disliked mathematics than any other subject.

The reasons given for liking or disliking subjects were too indefinite to be very meaningful. There were, however, indications that subjects were liked if the children could get them easily, if they made good grades, or if they liked the teacher. Very few children said subjects were liked because they were interesting.

Clubs Liked Best

There were indications that the children liked best the clubs they planned and ran largely by themselves. They did not like teacher organized and dominated clubs. Clubs that involved outdoor activities were especially popular.

Offices in School Clubs

Fifty-three per cent of group 1 children held some office in a school club or school organization at the time of this study, whereas 35 per cent of group 4 children held offices. Boys held more offices than girls.

Time Spent in Home Study Each Day

Table 15 gives the numbers of hours the children studied at home each day. Eighty-three per cent of the children studied two hours or less per day while 17 per cent studied more than two hours. Group 1 children studied somewhat less at home. Eleven per cent studied two hours or more, whereas 25 per cent of group 4 studied two hours or more.

TABLE 15

TIME SPENT IN HOME STUDY EACH DAY, IN PERCENTAGES OF CHILDREN

Hours	Groups		
	1	4	All
3+	0	4	2
2 to 3	11	18	15
1 to 2	41	44	43
1-	48	34	40

INTERESTS--VOCATIONAL

Vocational Choices

Table 16 shows that in general boys chose engineering, medicine, and farming most often with 26 per cent undecided. Girls chose teaching, commerical work, and nursing most often.

TABLE 16

VOCATIONAL CHOICES, IN PERCENTAGES OF NUMBER OF CHILDREN

	Groups					
	1		4		All	
	Boys	Girls	Boys	Girls	Boys	Girls
No choice	38	7	19	13	26	9
Teacher	0	38	0	42	0	40
Engineer	10	0	33	0	25	0
Stenographer or secretary	0	12	0	33	0	17
Doctor	14	0	11	0	12	0
Nurse	0	7	0	8	0	8
Farmer	14	0	6	0	9	0
Others	24	36	31	4	28	26

More boys in group 1 than in group 4 were undecided. Group 4 boys were especially frequent in the selection of engineering. Thirty-three per cent of group 4 girls and 12 per cent of group 1 girls selected commercial work. Group 1 girls had a wide variety of scattered choices as indicated by the fact that 36 per cent chose occupations other than the ones most frequently given as listed in the table. Only 4 per cent of group 4 girls had other choices.

The data secured by the question relative to parents' vocational choices, was compared with the children's choices. Thirty-two per cent of the parents had not made a choice according to the children, 31 per cent agreed with their

children, 27 per cent were willing for the child to follow his own choice and 10 per cent disagreed with the children's choices. Group and sex differences were slight.

INTERESTS--RELIGIOUS

Church Membership and Attendance

Eighty per cent of the children belonged to church with sex and group differences negligible.

As to attendance at Sunday school or some other religious school, 78 per cent often went, 4 per cent went sometimes and 17 per cent seldom went. Seventy per cent of the boys as compared with 91 per cent of the girls went often or sometimes. There were no group differences. Seventy-two per cent of all the children said they liked to go. Seventy-nine per cent of the girls liked to go and 65 per cent of the boys. For the groups, 60 per cent of group 1 and 85 per cent of group 4 liked to go. The indications are, that the girls went more often and more often liked to go than boys and that while both groups went about equally often, more of group 4 liked to go.

The reasons most frequently given for liking to go were that the lessons were interesting, they liked the teacher, they met their friends, they learned something, and they met nice people.

When asked why they went to church, 51 per cent said they enjoyed it, 25 per cent said because they were in the habit, 22 per cent said their parents sent them, and 9 per cent said they felt it was a duty. Again the indications are that more of group 4 children than group 1 went and more of them liked to go.

EMOTIONAL AND IMAGINATIVE LIFE

Worries

Thirty-nine per cent of the children said they worried about various things. School work was the cause given in most cases, although a few children said they worried about members of the family who were ill and about their own health. More of group 4, and especially the girls, said they worried about school work. This not surprising as, in general, their school success was not nearly as satisfactory as that of the children of group 1. The tests and examinations seemed to be the chief source of worry with inability to do the work also a common source, especially in group 4. Seven per cent worried because they could not keep up with home work.

Admittedly the term "worry" is indefinite and it is unsafe to make any very definite conclusions upon the basis of the response of the children to the questions asked. Their answers, however, may indicate certain trends.

Fears

About 50 per cent of the children said they were afraid of something. In order of frequency of mention the fears were: snakes, dogs, the dark, storms, accidents, high places, strange noises, being alone at home, burglars, and the unknown.

Anger

The things that made them most angry were mentioned in the following order of frequency: being teased, people unfair to them, a sibling taking their property or imposing on them, people lying to them, things not going right, people being sarcastic, and people being bossy.

Dreams

Eighty-one per cent of the children said they seldom had dreams, 17 per cent sometimes had them and 2 per cent had them often.

The things most frequently dreamed about in order of frequency of mention were: falling, scary movies, being hurt, animal after them, kidnapping, something they had read, and dreams that were not remembered. A great variety of things were given less frequently.

Imagination

Table 17 gives the percentages of children who said they liked to sit and imagine things. Such data are of course quite unreliable due to the vagueness of the term. The data seem to indicate, however, that the children in group 1 were more inclined to be imaginative than those in group 4. Also girls were more imaginative than boys.

TABLE 17

PERCENTAGES OF CHILDREN WHO LIKED TO IMAGINE THINGS

Groups								
1			4			All		
Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
67	81	76	50	75	60	56	79	68

Table 18 gives the things the children said they liked best to imagine. The girls most frequently liked to make up stories to play while the boys liked to imagine themselves as grown up.

TABLE 18

WHAT CHILDREN LIKED BEST TO IMAGINE, IN PERCENTAGES OF CHILDREN

	Boys	Girls	All
Make up stories to play	16	53	35
When they are grown up	28	38	33
Traveling	5	8	7
Inventions that may be made	11	0	5
Make up games	7	2	4
Winning fame	3	2	2
Happenings on other planets	4	2	2

Original Writing

Sixty per cent of group 1 children and 40 per cent of group 4 children said they had written original stories, poems, and music. In both groups the girls had much more frequently done so than the boys.

Wishes

The children gave a great variety of specific responses when asked the three things they would most like to have. In Table 19 these are grouped under the general headings indicated. The figures indicate the percentages of children wishing one or more of each type. Ownership of things was most frequent for boys and girls, with all the boys and 80 per cent of the girls wishing for something which came under this heading. In matters of travel and emotional security, the girls' wishes were considerably more frequent than the boys.

TABLE 19

TYPE OF WISHES, IN PERCENTAGES OF CHILDREN, WISHING ONE OR MORE OF EACH TYPE

Type	Boys	Girls	All
Ownership	100	85	92
Self development	26	24	25
Travel	18	29	23
Vocational	11	15	13
Economic security	40	32	35
Emotional security	7	18	13
Pleasures	9	8	8
Health	7	12	10
Altruistic	2	8	5
Escapes	5	0	2

MENTAL AND PHYSICAL HEALTH

Sickness and Accidents

Thirty per cent of the children had been sick in bed during the previous six months and 34 per cent had at sometime had an accident or serious illness. The percentages were approximately the same for groups and sexes.

Examinations by Doctors and Dentists

Forty-seven per cent of the children had been examined by a doctor outside of school within the previous six months. Fifty-six per cent of group 1 children and 40 per cent of group 4 children had been examined.

Seventy-six per cent of the children visited a dentist twice or more a year, 10 per cent when needed, and 14 per cent never visited a dentist.

Sleeping Conditions

Eighty-three per cent of the children slept in bed alone and 66 per cent in room alone. No group or sex differences were found.

Eating Habits

Approximately 70 per cent of the children said there were some foods they particularly disliked but 30 per cent said they sometimes ate these foods.

Eighty per cent had eaten between meals the day before the interview, usually after school in the afternoon. Thirty-five per cent had eaten before going to bed.

There were no especial group or sex differences in eating habits except that a somewhat higher percentage of boys than girls ate between meals during the day.

Amount of Sleep

Table 20 shows the average number of hours sleep a night for one week. Fifty-eight per cent of group 1 children got ten or more hours of sleep a night as did 37 per cent of group 4. An examination of the variation for different nights showed that about 90 per cent of the children interviewed had fairly regular hours.

PERSONALITY RATINGS

As previously stated, the 250 children in this study were rated by their teachers on the Hayes, "Scale for Evaluating the School Behavior of Children Ten to Fifteen." Each child was rated by each of his teachers so that the

TABLE 20

AVERAGE NUMBER OF HOURS SLEEP A NIGHT, IN PERCENTAGES OF CHILDREN

Hours	Groups 1 Boys	1 Girls	1 All	4 Boys	4 Girls	4 All	All Boys	All Girls	All All
11+	0	0	0	0	4	2	0	2	1
10-11	67	54	58	30	44	35	44	50	47
9-10	34	45	42	66	50	60	55	47	51
8-9	0	0	0	4	2	3	1	1	1

average number of ratings for each child was approximately four. Thus the total number of ratings was about 1000.

Table 21 gives the percentages of children whose rating scores were above and below the medians for the children used to establish norms by Hayes. These are given for total scores on this 100 item scale and for each of the eight sub groups of items. Boys and girls are given separately and combined

TABLE 21

PERCENTAGES OF CHILDREN WHOSE PERSONALITY RATING SCORES WERE ABOVE OR BELOW THE NORM MEDIAN ON THE HAYES RATING SCALE

Above or Below Median	Groups 1 Boys	1 Girls	1 All	4 Boys	4 Girls	4 All	Groups 1, 2, 3, and 4 combined Boys	Girls	All
Total Personality Scores									
Above	82	97	93	39	41	41	56	78	69
Below	18	3	7	61	59	59	44	22	31
Relations to others generally									
Above	76	96	89	50	50	50	66	85	78
Below	24	4	11	50	50	50	34	15	22
Respects for rights of others									
Above	38	69	58	28	46	42	40	62	52
Below	62	31	42	72	54	58	60	38	48
Relations to Teachers									
Above	34	54	48	17	25	20	38	44	41
Below	66	46	52	83	75	80	62	56	59
Relations to other Pupils									
Above	66	96	86	47	38	44	56	82	71
Below	34	4	14	53	62	56	44	18	29
Initiative									
Above	75	83	81	35	32	35	54	64	61
Below	25	17	19	65	68	65	46	36	39
Health Habits									
Above	76	97	88	29	64	42	54	84	72
Below	24	7	12	71	36	58	46	16	28
General Interests									
Above	86	81	83	36	29	33	55	65	61
Below	14	19	17	64	71	67	45	35	39
Study Habits									
Above	66	98	87	36	41	38	49	79	64
Below	34	2	13	64	59	62	51	21	36

for groups 1 and 4 and for the four groups combined.

For the total group of children 69 per cent were rated above the median norm on total score. On the sub groups of items the children were rated especially low on "Relations to Teachers" and comparatively low on "Respect for Rights of Others."

On total score and on every sub group of items the boys were rated lower than the girls with the same general trend with respect to groups of items as for boys and girls combined. The girls were rated higher particularly on Health Habits, Study Habits, and Relations to Other Pupils. While ratings are not to be considered as giving a very accurate portrayal of personality, certainly the data presented here indicate that, as judged by the teachers, the boys were not making on the average nearly as satisfactory adjustments as the girls. The cause may lie in the failure of the school to establish an environment as suitable for boys as for girls or it may reveal a tendency for women teachers, as most of the raters were, to rate girls higher than boys. Whatever the cause or causes, the consistent differences should challenge the careful consideration of those responsible for planning the educational environment of adolescents.

Comparing group 1 and group 4 children, a striking difference is found between the percentage rated above the median norm on total personality score and on all sub groups of items. Apparently, with respect to all types of behavior relating to school situations the group 4 children were considered inferior in their adjustments by the teachers who rated them. These were children who were not succeeding very well in scholarship in the school, whose intelligence quotients were comparatively low, and who were considered relatively low in personality adjustment when the groups were first made up. It is not surprising then that they should be rated so much lower on this scale than group 1 children, who were selected on the basis of good adjustments to school situations. It is interesting to speculate whether group 4 children are generally more poorly adjusted to life or whether the school is not adapted to them.

HEALTH RATINGS

As a part of the regular health program of the Milne School each child is given a thorough physical examination by the school physician near the beginning of each school year. In addition to the detailed recording of the results of the examination, each child is given a general health rating. A rating of A indicates excellent health and freedom from physical defects, B indicates good health, C indicates fair health, D indicates poor health, and E indicates very poor health.

The percentages of the 250 children given the various health ratings at the beginning of this study were as follows: A, 29 per cent; B, 45 per cent; C, 22 per cent; D, 3 per cent; E, 1 per cent. There were no significant sex or group differences. While the ratings are too general to be considered as objective evaluations, they furnish indications that in general this was a group of children who were in good health and relatively free from serious defects.

The percentages of all children included in this study with the various physical defects indicated were as follows: underweight, 17 per cent; eye defects, 13 per cent; defective tonsils, 10 per cent; dental defects, 10 per cent; overweight, 5 per cent; ear defects, 3 per cent; heart defects, 2 per cent. These defects were found in approximately the same frequency in both boys and girls except that 16 per cent of the girls had defective eyes and but 9 per cent of the boys.

For groups 1 and 4 the frequency of defects was also approximately the same except for eye defects. Seventeen per cent of group 1 had eye defects but 7 per cent of group 4. In these two groups sex differences were not found.

It was the girls in group 3 that accounted for the sex differences in eye defects found for the entire group.

VERBAL RESPONSES IN CLASSROOMS

Each of the 250 children was observed in a classroom for eight, 20 minute periods. A code system was used for recording all verbal activities of pupils on a chart containing a block for each pupil in the room.

Table 22 gives the data on the verbal responses of the children in each of the 4 leadership groups for boys and girls separately and combined. The figures given are the average number of responses during the 20 minutes time unit used in all observations.

TABLE 22

AVERAGE NUMBER OF VERBAL RESPONSES FOR 20 MINUTE OBSERVATION PERIODS

Leadership Groups	Sex Groups	Number of Observations	Responses					
			1 Command of subject matter		Desirable aggressiveness		Undesirable aggressiveness	
			Median	Q	Median	Q	Median	Q
1	Boys	504	2.4	1.69	1.4	1.40	.15	.33
2	and	504	2.6	1.13	1.7	1.00	1.37	1.54
3	Girls	512	2.6	.83	1.5	.66	.19	.27
4		480	2.8	.86	1.3	.80	.19	.20
All		2000	2.6	.83	1.5	.64	.25	.35
1	Boys	168	2.9	1.16	2.1	.91	.30	.19
2	Boys	144	3.1	.83	2.1	.54	.53	.34
3	Boys	216	2.6	1.04	1.6	.87	.58	.43
4	Boys	288	3.1	.95	1.8	.92	.34	.27
All	Boys	816	2.9	1.02	2.0	.86	.41	.30
1	Girls	336	2.3	.80	1.2	.49	.13	.07
2	Girls	360	2.5	.76	1.4	.64	2.05	1.13
3	Girls	296	2.6	.72	1.4	.63	.15	.08
4	Girls	192	2.6	.65	1.0	.50	.13	.07
All	Girls	1184	2.5	.73	1.5	.64	.18	.41

The responses recorded by the detailed code system were grouped under the following three heads as given in the table:

1. Command of subject matter.

   The following types of responses were included under this heading: voluntary contributions not asked for--satisfactory; assigned contributions--satisfactory; answer to question asked class--satisfactory; answer to question asked pupil directly--satisfactory; voluntary comment on lesson--no one talking--of value; relevant interruption--comment--contribution--of value.

2. Desirable aggressiveness.

   The following types of responses were included under this heading: voluntary contributions--satisfactory; answer to question asked class--satisfactory; question asked pupil--relevant--no one talking; voluntary comment on lesson--no one talking--of value.

3. Undesirable aggressiveness.

   The following types of response were included under this heading: voluntary contribution not asked for--unsatisfactory; answer to question asked class--unsatisfactory; question asked by pupil--irrelevant--no one talking; question asked by pupil--relevant--interruption; question asked by pupil--irrelevant--interruption; voluntary comment on lesson--no one talking--of no value; relevant interruption--comment--contribution of value; relevant interruption--comment--contribution of no value; irrelevant com-

ment--no one talking; irrelevant interruption--comment--teacher or pupil talking.

For all boys and all girls combined the median number of responses indicating command of subject matter, desirable aggressiveness, and undesirable aggressiveness do not vary greatly for the 4 leadership groups, except that group 1 has a smaller number of undesirable aggressive responses than any other group and group 2 has an especially high number. The fact that the values of Q are much higher for groups 1 and 2 indicates a much greater variability in the responses of the children in these groups than of the children in groups 3 and 4. There is no marked difference between the boys in each of the four groups in the three types of responses, except that group 1 boys show a somewhat higher average number of desirable aggressive responses and a lower number of undesirable aggressive responses than the boys in the other groups. For the girls the differences are slight for the 4 groups, except for a much larger number of undesirable aggressive responses for group 2.

Comparing boys and girls it is seen that the boys markedly excelled the girls in responses indicating command of subject matter and desirable aggressiveness. They also had more responses indicating undesirable aggressiveness except in the case of the girls in group 2. In summary the data indicate that:

1. The pupils in leadership group 1 showed practically the same command of subject matter and desirable aggressiveness as the pupils in the other groups. They were somewhat less aggressive in undesirable ways.
2. Boys excelled girls in the number of responses indicating command of subject matter and desirable aggressiveness. They were also more aggressive in undesirable ways, except in the case of the girls in group 2. In general, then, the boys showed a tendency to make more verbal responses of both desirable and undesirable kinds than the girls.

MARKS IN SCHOOL SUBJECTS AND PROGRESS THROUGH SCHOOL GRADES

Table 23 gives the median marks and the quartile deviations in the various school subjects. These were computed from the marks assigned at the end of the first semester for the first year of this study. It was intended to analyze the marks for each semester during the period of this study but a preliminary analysis indicated that the marks for the semester given are representative for the other semesters.

The Milne School assigns numerical marks for all subjects. Just what these marks represent or how reliable they may be is impossible to say. No doubt they are subject to all the criticisms of teachers' marks so frequently found in the professional literature.

For groups 1 and 4, Table 23 indicates that for every subject group 1 excelled group 4 to a marked extent. This is to be expected since group 1 was of higher academic intelligence and scored higher on standardized achievement tests. Group 4 was particularly low for Latin and French, although but few students from this group were taking these subjects.

Comparing the boys and girls for all four groups combined it is seen that the girls received higher marks than the boys in all subjects except history, science, and social studies, and in these the differences were slight.

For all boys and girls combined it is interesting to note that the average for Latin of 74 per cent was much lower than for any other subject. All other subjects are closely bunched between 81 and 86. It seems evident that the standards for marking in Latin are for some reason inconsistent with the standards applied in other subjects.

A few students took commercial subjects (commercial arithmetic, shorthand,

bookkeeping, and typing), but there were not more than 7 students in any one of these classes from groups 1, 2, 3, and 4 combined, so they are not included in Table 23.

TABLE 23

MARKS IN SCHOOL SUBJECTS FOR ONE YEAR

Subject	Groups 1			Groups 4			Groups 1, 2, 3, and 4 Boys			Girls			All		
	No.	Med.	Q	No.	Med.	Q	No.	Med.	Q	No.	Med.	Q	No.	Med.	Q
Latin	25	83	5.7	10	65	4.6	26	68	7.6	56	75	6.7	82	74	6.5
French	19	86	5.8	8	66	6.0	22	79	8.2	39	84	6.7	61	82	6.0
History	11	85	4.3	16	77	6.8	28	85	6.8	26	83	5.6	54	84	6.3
Civics	10	88	2.7	11	76	2.8	15	81	4.2	27	86	3.8	42	84	4.5
Math	53	91	4.7	48	76	5.0	81	82	6.9	121	84	7.5	202	83	7.2
English	62	90	3.5	57	78	3.4	99	81	5.1	143	86	5.0	242	84	5.6
Art	18	85	6.8	21	78	2.5	35	80	4.2	50	84	5.8	85	81	4.2
Industrial Art	31	86	3.7	30	80	3.0	51	81	2.7	72	84	3.8	123	83	3.4
Science	44	90	4.3	43	81	5.1	75	84	5.5	99	83	4.9	174	84	5.1
Social Studies	30	90	1.9	29	79	2.8	49	85	4.3	69	85	5.0	118	85	4.7
Social Language	15	92	4.4	14	83	3.0	22	85	4.9	36	87	4.6	58	86	4.1

Table 24 shows the percentages of children skipping or repeating one or more grades in the first six grades. More children in group 1 than in group 4 skipped grades.

TABLE 24

PERCENTAGES OF CHILDREN REPEATING AND SKIPPING ONE OR MORE GRADES IN THE FIRST SIX GRADES

	Groups 1			Groups 4			Groups 1, 2, 3, and 4		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
Grades skipped	33	36	35	8	4	5	20	22	21
Grades repeated	10	5	6	22	13	18	16	8	11

For all groups combined, 20 per cent of the boys had skipped grades and 16 per cent had repeated grades. Of the girls 22 per cent had skipped grades and 8 per cent had repeated grades. Here again is evidence that the girls adjust to the school program better than the boys, since fewer of them had to repeat grades.

SUMMARY

The data reported in this study will be summarized under three headings: general trends, sex differences, and group differences. (Leadership group 1 compared with leadership group 4.)

I. General Trends

1. The children in this study generally came from homes with a high occupational status in which the average number of children was 2.4.
2. The median I.Q. was 115.
3. Fifty-six per cent of the homes had 125 or more books in the home.

4. The children spent an average of 5.4 nights a week at home, usually listening to the radio, reading, or studying. If not at home they most frequently went to the movies, visited friends, or had a date.

5. They much more frequently told their troubles and joys to their mother than to their father.

6. They thought their mothers were much more often nervous than their fathers.

7. The methods of discipline most often used by their parents were: reasoning, scolding, and depriving of pleasures.

8. The things the children did that their parents disliked most were: coming home late, quarreling with sibs, teasing sibs, and disobeying parents.

9. About 50 per cent of the parents played some games and sports with their children.

10. Most of the children helped some with the work at home such as setting the table, running errands, and caring for their room.

11. Half of the children had an allowance. Sixty-one per cent earned some money.

12. Sports and reading were the out of school activities liked best. Swimming was the most popular sport.

13. A majority of the children had read a good many books and magazines not required by the teachers.

14. Humorous sketches were the most popular radio programs.

15. The children went to the movies on average of about one night a week. Dramatic and humorous movies were liked best.

16. Most of the children could dance and liked to go to parties.

17. The children wanted the teachers to keep good order in the classrooms.

18. Clubs which were not teacher dominated were liked best. Clubs involving out door activities were especially popular.

19. Eighty per cent of the children belonged to church. A majority of them went to Sunday school regularly.

20. The most frequent source of worry was school work.

21. The most frequent fears were: snakes, dogs, the dark, and storms.

22. The things that made the children most angry were: being teased, people being unfair to them, and a sib imposing upon them.

23. The children dreamed most often of: falling, scary movies, and being hurt.

24. The wishes they expressed were most often for material things.

25. Seventy per cent of the children had food dislikes. Eighty per cent ate between meals.

26. About 90 per cent of the children had fairly regular sleep habits, and 98 per cent got from 9 to 11 hours sleep a night.

27. Sixty-nine per cent of the total group of children were rated above the median by their teachers on the Hayes Personality Rating Scale. They were rated lowest on items concerned with relations to teachers and respect for rights of others.

28. On the health ratings, 29 per cent were rated A; 45 per cent, B; 22 per cent, C; 3 per cent, D; and 1 per cent, E. The most frequent physical defects were: under weight, eye defects, defective tonsils, and dental defects.

29. Marks on school subjects were fairly comparable for all subjects except that the average mark for Latin was much lower than for any other subject.

II Sex Differences

The data indicate that the boys in this study as compared with the girls:

1. Went out more evenings.
2. Played more often on vacant lots and in the streets.

3. More often earned some money.
4. Had organized more clubs and gangs.
5. Held more offices in clubs.
6. Expressed engineering as the first vocational choice, more often.
7. Liked studying mathematics better.
8. Made more verbal responses in the classrooms indicating command of subject matter and both desirable and undesirable aggressiveness.
9. Had more often repeated school grades.

The girls as compared with the boys:

1. Were at home more evenings.
2. Read and studied much more.
3. Played in backyards more often.
4. Played more with sibs.
5. More often told their mother their troubles or joys.
6. More often had an allowance.
7. Liked reading better.
8. Liked romantic movies better.
9. More often could dance.
10. Liked studying English better.
11. Gave teaching more often as the first vocational choice.
12. Worried more about school work.
13. More often said they liked to imagine games to play.
14. Had done more creative writing.
15. Were higher on total score on personality ratings and on all sub groups of items. They were especially high as to health habits, study habits, and relations to other pupils.
16. More often had eye defects.
17. Had higher school marks in all subjects but history, science, and social studies. In these they were about equal to the boys.
18. Had more often skipped grades in school.

III Group Differences

The data indicate that group 1 as compared with group 4:

1. Had more girls in proportion to boys as selected on the basis of combined measures of intelligence, school achievement, and personality.
2. Had a higher median intelligence quotient (125 as compared with 107); a higher reading quotient (131 as compared with 101); and a higher arithmetic quotient (133 as compared with 121).
3. Had parents who read more magazines of a substantial type.
4. Were at home more evenings.
5. Studied and read more magazines and books. The variety of reading was also greater.
6. Visited with friends more often.
7. Played more with sibs.
8. Held more offices in clubs and had organized more clubs and groups.
9. Liked dramatic movies better.
10. Made more constructive suggestions for improving the school.
11. More often worked to get good grades to please their parents.
12. Had a wider variety of vocational choices.
13. Were more imaginative and had done more creative writing.
14. Were rated higher with respect to all types of behavior included on the Hayes rating scale.
15. Had more eye defects.
16. Had higher school marks. The differences were greatest for Latin and French.
17. Had skipped more grades in school.